CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated an an aid to United States Government research.

SCIENTIFIC-INFORMATION REPORT

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I. ASTRONOMY

1. Data on Continuous Emission of Spectra of AG Dra, NX Mon and VY Ori Discussed

"Concerning the Nature of Continuous Emission," by L. V. Mirzoyan, Byurakan Astrophysical Observatory, Academy of Sciences Georgian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 4, 1 Apr 58, pp 667-670

Discusses data on continuous emission of spectra of AG Dra, NX Mon and VY Ori. The results obtained by K. H. Bohm (Zs. f. Ap. (1957) are interpreted as explaining the continuous emission as being not only of nonthermal origin, but as generated by radiation of relativistic electrons in the magnetic fields of the upper layers of the stellar atmospheres.

Analytical

2. New Chromathermograph

"The KhT-2 Chromathermograph," by Engr Ye. Fesenko; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 17, 7 Feb 58, p 4

"The Design Bureau of Petroleum Instruments (KBNP) developed the thermodynamic gas analyzer KhT-2 as a result of work done jointly with the All-Union Scientific Research Institute of Petroleum Geology and Prospecting (VNIGNI).

"The new device that has been developed makes it possible to conduct three basic types of analysis, viz., by stationary chromathermography with an uninterrupted feeding of the gas being analyzed, stationary chromathermography with intermittent feeding of samples of the gas being analyzed, and nonstationary chromathermography.

"The first two procedures are especially well suited for the detection of microimpurities, because the sensitivity of the analysis is increased tenfold as a result of enrichment. Application of the third procedure considerably improves the degree of separation of complex mixtures.

"In analysis by the method of stationary chromathermography the purified carrier gas is fed into the proportioning device; the gas to be analyzed is also conducted there. Analysis according to the first two procedures begins with the switching-in of the proportioning device by the cycling relay. Thus, the sample of the gas is introduced into the air current and is conducted into the column. After some time, a thermal field develops in the column. This field has a straight-line advancing front slanting forward and exhibits a steep drop in the back. The field moves from the entrance end of the column to the exit end.

"The magnitude of the thermal wave is such that the layer of absorbent always has a sufficiently long cooled section which prevents passage of the unseparated mixture through the column.

"Every component of the mixture being analyzed moves together with the thermal field in the zone of its characteristic temperature. As the temperature zones approach the exit end of the column, the corresponding components of the mixture come out of the column and after a second purification are transferred into the receiver of the fixation [recording] device.

"The analysis is completed when the exit end of the column is heated to a temperature which exceeds the characteristic temperature of the heaviest component of the mixture being analyzed. After the end of the analysis, the apparatus is prepared for the analysis of the succeeding sample.

"Analysis of the nonstationary chromathermography type made on the KhT-2 device differs from the procedure described above in that the cycling relay has been reset in such a manner that heating of the column begins at the exit end and the thermal field moves from the exit end to the entrance end (i.e., from the top to the bottom).

"Consequently, the components of the mixture being analyzed move from the cold portion of the adsorbent layer to the heated portion and receive a corresponding acceleration, which considerably improves the degree of separation.

"The KhT-2 chromathermograph makes it possible to analyze within 6 minutes a complex mixture of saturated hydrocarbons (up to and including hexane) with a sensitivity approaching 0.002%.

"The conditions under which the analysis is conducted are automatically regulated by the setting of the relay and can be readily changed. The analyzer can be equipped with different columns for the analysis of various other hydrocarbons and of their isocompounds.

"The separation column, which is executed in the form of a spiral metal tube, contains 20 grams of adsorbent. The length of the layer of adsorbent in the column is 3.5 meters.

"Working drawings for the series production of the KhT-2 chromathermograph are being completed at VNIGNI and KBNP at present. Work is also being done on extending the range of applications of this device. Testing of the KhT-2 chromathermograph under industrial conditions has been started at the Moscow Petroleum Conversion Plant."

Defoliants

3. Preharvest Elimination of Cotton Leaves by Chemicals

"New Chemicals for the Preharvest Elimination of Cotton Leaves," by L. I. Korolev, V. A. Voytekhova, and L. D. Stonov, Scientific Research Institute for Fertilizers and Insectofungicides and the State Institute of Applied Chemistry; Moscow, Vestnik Sel'skokhozyaystvennoy Nauki, No 1, Jan 58, pp 82-90

The results of tests made in 1955 and 1956 with 106 chemicals are described. Most of the chemicals which proved effective belong to two groups of chemicals: compounds of monochloracetic acid and hydrazine. It is recommended that the search for new chemicals among the derivatives of these compounds be continued.

Fuels and Propellants

4. New High-Energy Fuels

"New Fuels for Planes Propelled by Reaction Motors," by Engr-Maj V. Parfenov, Candidate of Technical Sciences; Moscow, Sovetskiy Voin, Vol 39, No 22, Nov 57, p 24

More than 100 tons of kerosene is loaded on a modern bomber before the flight. A plane weighing 80 tons weighs 180 tons after it has been fueled. The large weight of the fuel considerably reduces the useful load of the plane.

When chemical fuels are used, the energy contained in the outer shell of electrons is utilized exclusively, while the energy of the atomic nuclei remains unused. To reduce the weight of the fuel, elements with a small nuclear mass are preferred, e.g., hydrogen, lithium, beryllium, and boron.

The energy contained in the nuclei of atoms can be utilized by employing nuclear fuels. However, the application of nuclear fuels will not result in an increase in the useful load of the plane, because heavy shielding made of lead, iron-reinforced concrete, or similar materials will be required.

Under the circumstances, extensive research is being done on new types of chemical fuel with a higher calorific value and efficiency. For instance, chemists are attempting to utilize the heat which is evolved during

the combustion of powders of light metals. Finely dispersed metal dust is introduced into ordinary fuel. Of the greatest interest from the standpoint of the propulsion of planes are suspensions containing finely dispersed magnesium, aluminum, beryllium, and boron.

However, fuels in which finely dispersed metals are contained give rise to difficulties because of the possibility of clogging: complicated pumps and filters which are not clogged by the suspended particles of metal will be required. Another possibility of increasing the efficiency of liquid fuel is by dissolving in it metal salts such as lithium nitrate or lithium perchlorate.

Other types of high-energy fuel are compounds of boron including boranes and their derivitives. Pentaborane is considered to be the best among the boron fuels. This compound has the greatest content of energy per unit of weight and volume; on combustion it evolves 1 1/2 times more heat than ordinary types of aviation fuel. Pentaborane burns rapidly; for this reason large quantities of it will be oxidized in small combustion chambers. As a result, one may reduce the length of the engine and lower its weight.

However, the application of pentaborane does not bring about a technological revolution in engines that will be used in the future: this fuel cannot supply a sufficient amount of energy for jet and rocket missiles to be used for flights in outer space. Interplanetary flights will be possible soon if employment of free-radical fuels becomes feasible. Free radicals can be produced by the application of high temperatures, exposure of molecules to the action of high-frequency electric fields, irradiation with gamma rays, or bombardment with high-energy particles. For instance, stable radicals can be obtained by bombarding in this manner methyl alcohol which has been brought to a low temperature. During the past 6 years, other methods of producing free radicals at very low temperatures have also been proposed. However, the concentrations of free radicals which have been obtained in laboratories do not exceed one percent, while a concentration of at least 10% will be required for applications in reaction engines.

One of the problems in connection with the application of free-radical fuels will be the storage of these chemically unstable fuels. At present, cooling to low temperatures approaching the absolute zero is regarded as the only method for the stabilization and storage of free radicals. After being cooled to temperatures in this range all gases and liquids are transformed into solids. When free-radical fuels are used instead of the ordinary chemical fuels employed at present, bars consisting of solid free-radical fuel will be transported to planes instead of hundreds of tons of kerosene. These bars will be transported in special refrigerators. To burn the new type of fuel, reaction engines of special design will be required. The solid free-radical fuels consisting of single-atom molecules unusual properties, as has been found out in experiments. Even at very low

temperatures they emit blue light and periodically exhibit flashes of colored light. When the temperature has been raised to a small extent (to 20 or 30° above absolute zero), the excited atoms in the solidified fuel combine at an intensive rate into molecules, evolving hugh quantities of heat and light.

Scientists are of the opinion that free-radical fuels will be applied for the propulsion of some jet engines and rocket engines within 5-10 years. The application of such fuels will considerably increase the cruising range and useful load of planes (to illustrate the greater efficiency of solid free radical fuels, one may say that the use of 16.5 tons of solid fuel consisting of atomic hydrogen will increase the range of the plane to six times above that of a conventional plane fueled with 100 tons of kerosene).

5. New Types of Fuel

"New Types of Fuel for Reaction Engines," by Engr-Maj V. Parfenov, Candidate of Technical Sciences; Moscow, Sovetskaya Aviatsiya, No 233, 2 Oct 57, p 2

This article is almost identical with that published by the same author in Sovetskiy Voin (see Item No 4, above); it gives the following additional information in regard to the possibilities of adding metals and metal compounds to hydrocarbon fuels: "It has been reported that it is possible to disperse lithium or lithium hydride in kerosene."

6. New Fuels for Planes and Rockets

"The Search for New Types of Fuels," by V. Kemskiy, Candidate of Technical Sciences; Moscow, Sovetskaya Aviatsia, No 79, 3 Apr 58

Developments in the field of high-energy fuels for supersonic planes and far-range rockets are discussed on the basis of work done outside the USSR, particularly in the US. After outlining the objections to the use of liquid hydrogen (its large specific volume) and berylium and its compounds (excessive cost and toxicity), the author discusses in the following manner the prospects of the use of boron and boron derivatives as fuel:

The thermal energy release capacity of boron is 40% higher than that of kerosene. Furthermore, the efficiency of boron as a fuel can be improved by combining it chemically with hydrogen. Among the hydrogen compounds of boron (boranes) three compounds, namely, diborane, pentaborane, and decaborane, have been investigated most thoroughly. According to reports in the non-USSR press, at least two types of borane fuel are available. Although the exact chemical constitution of these fuels has not been indicated, there are reasons to believe that one of the new exotic fuels of this type is a modification [a homolog or derivative] of decaborane.

The erection of five industrial plants producing approximately 20 tons of borane fuel per day is planned in the US for 1958-1959. However, on the basis of the production capacity mentioned, the total quantity of borane produced at all of these plants in 4 days will be required for fueling a single B-52 bomber. Nobody has yet flown a plane equipped with an engine operating on pure borane fuel. However, experiments have shown that boranes can be used as fuel for liquid-propelled rockets and ram jets. The principal product of the combustion of boranes, boron oxide, clogs and corrodes turbine blades. For this reason boron fuels cannot be used yet for turbojets and turbines. The US Air Department has given out a contract for the development of a new bomber using borane fuel. According to press reports, this bomber will use conventional fuels at cruising speed and employ borane fuel when approaching the target. This, according to the designers, will make it possible to approach the target and fly away from it at a speed twice the cruising speed.

According to reports in the non-USSR press, a new exotic fuel containing boron was used in launching the US earth satellites.

Free-radical fuels and the use of liquid hydrogen heated by the radiation of the Sun for the propulsion of space reconnaissance vehicles are also under consideration.

7. Nature of Interaction Between Methane and Ozone

"The Interaction Between Ozone and Methyl Hydroperoxide," by N. A. Kleymenov and A. B. Nalbandyan, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 118, No 1, 1 Jan 58, pp 125-127

It was established in earlier work done by the authors that ozone below its temperature of decomposition does not react directly with methane (cf. N. A. Kleymenov, I. N. Antonova, A. M. Markevich, and A. B. Nalbandyan, Zhurnal Fizicheskoy Khimii, Vol 30, 1956, p 794). There is, however, a reaction between molecular ozone and methyl hydroperoxide, which is an intermediate product formed predominantly at low temperatures. The kinetics of the reaction between methyl hydroperoxide and ozone have been investigated in this instance. The velocity constants of this reaction at temperatures of 25-64°C were determined.

8. Subterranean Gasification of Coal With Use of Steam and Oxygen

"Preliminary Results of the Investigation of the Process of Subterranean Coal Gasification Using Steam-Oxygen Blowing in an Experimental Section of the Moscow 'Podzemgaz' Station," by N. Z. Brushteyn, Candidate of Technical Sciences, and Engr M. A. Kulakova, All-Union Scientific Research Institute of Subterranean Gasification [VNIIPodzemgaz]; Moscow, Podzemnaya Gazifikatsiya Ugley, No 4, Oct-Dec 57, pp 7-11

Experimental work on the subterranean gasification of Moscow lignite using steam-oxygen-air blowing was originally conducted at the "Podzemgaz" (Subterranean Gasification) station in the vicinity of Moscow. In work done before 1954, the possibility of producing by this method a gas with the correct ratio of $(CO + H_2)/N_2$ for the synthesis of ammonia was established. The results are described in articles published in Podzemnaya Gazifikatsiya Ugley, No 2 and 4-5, 1954. In 1954 the installation for the production of oxygen had to be repaired: blowing with oxygen was interrupted until 1957 and then resumed. Results obtained in 1957 are described in the present article. In the experiments that were conducted air-oxygen mixtures containing 60, 65, 67, and 70% of oxygen were employed. The favorable results obtained in 1953 were confirmed in the work done at present. Gasification of the identical lignite by the fluidized solids method with the application of steam-oxygen-air blowing was performed for purposes of comparison. It was established that gas produced by blowing with oxygen-enriched air has an increased heating value, so that it can be used to advantage as a fuel gas.

9. Present Status of Subterranean Gasification of Coal on an Industrial Scale With Use of Oxygen Blowing

"The Economic Expediency of Using Oxygen in the Subterranean Gasification of Coal," by Ye. K. Shmakova, Candidate of Economic Sciences, All-Union Scientific Research Institute of Subterranean Gasification; Moscow, Podzemnaya Gazifikatsiya Ugley, No 4, Oct-Dec 57, pp 67-69

As early as 1935-1936, USSR investigators considered the possibility of using oxygen in the subterranean gasification of coal with the view of making this process more efficient and improving the quality of the gas. However, the use of oxygen for this purpose was not feasible at the time because only limited facilities for its production were available and the cost of this gas was high. The situation has changed since the end of

World War II: high-capacity installations for the production of oxygen have been developed and subterranean gasification of coal with the use of oxygen can now be transferred from the experimental stage to the stage of industrial application.

A considerable expansion of the use of oxygen has been provided for under the Sixth Five-Year Plan: oxygen will be used to an increased extent in metallurgy, in the chemical industry, for the conversion of natural gas to acetylene, and in the gasification of solid fuels to produce gas for technical applications. The application of oxygen in the subterranean gasification of coal will be expedient in connection with this expansion of the production and uses of oxygen.

It had been established in 1935 in experiments conducted at the Gorlovsk "Podzemgaz" station that by using air enriched with oxygen to an O_2 content of 65% one can produce a gas with a high calorific value from coal by the method of subterranean gasification. Experiments at the "Podzemgaz" station in the Moscow region established that oxygen blowing is also of advantage in the gasification of lignite [see Item No 8, above].

Gas produced by oxygen blowing can be used for increasing the calorific value of gas for power generation produced at the "Podzemgaz" station in the Moscow region. By using the oxygen capacity available at this station (1,000 cubic meters of O_2 per hour) and employing the oxygen efficiently, one can produce approximately 2,400 cubic meters of gas per hour with a calorific value of 1,740 kilocalories. By mixing this gas with ordinary gas obtained by subterranean gasification of coal, one can increase the average calorific value of the gas by 50-60 kilocalories at a total output of 40,000 cubic meters of gas per hour.

Calculations made by the technicoeconomic sector of the All-Union Scientific Research Institute of Subterranean Gasification show that it pays to use oxygen even in the Moscow region, where the cost of electric power is very high. In regions where the cost of electric power is lower (the Donets Basin, Angren, the Kuznetsk Basin, etc.) application of oxygen blowing in the subterranean gasification of coal will be of correspondingly greater advantage than in the Moscow coal-bearing region.

10. Distribution of Carbon Dioxide Concentrations in Gasification of Coal With Oxygen Blowing

Trudy Instituta Goryuchikh Iskopayemykh AN SSSR, Tom VII, Podzemnaya Gazifikatsiya Topliva (Works of the Institute of Mineral Fuels, Academy of Sciences USSR, Vol 7, Subterranean Gasification of Coal), Academy of Sciences USSR, Moscow, 1957, 113 pp, reviewed by S. P. Golger; Moscow, Podzemnaya Gazifikatsiya Ugley, No 4, Oct-Dec 57, pp 69-71

"In an article entitled 'Regularities Underlying the Process of Steam-Oxygen Gasification,' B. M. Derman demonstrates that the analytical solution of the problem of the distribution of CO_2 concentrations and temperatures, as applied by B. V. Kantorovich in the case of the oxidation of carbon with oxygen, can be expanded to cover the oxidation of carbon with pure oxygen.

"Using the method of general process characteristics which has been developed by Kantorovich, Derman solved the problem of the distribution of carbon dioxide concentrations and temperatures throughout the length of the reaction space during the gasification of carbon with water vapor or a water vapor-oxygen mixture."

11. Review of USSR Developments Pertaining to Application of Oxygen in Nitrogen Industry

"Application of Oxygen in the Nitrogen Industry," by Engr Ye. Ya. Mel'nikov and Engr S. I. Kargin; Moscow, Kislorod, Vol XI, No 1, Jan 58, pp 1-16

In the introduction to the article, current trends in the application of oxygen in the USSR nitrogen industry are characterized as follows:

"In the nitrogen industry of the USSR, which was created during the years of the First Five-Year Plans, oxygen has been used from the very beginning in the technological processes that were applied. This oxygen was obtained as a by-product of the production of nitrogen by air fractionation. However, the scale on which this oxygen was used at first in the nitrogen industry was rather limited: it was employed only in the preparation of the catalyst for the ammonia synthesis. The by-product oxygen originating at nitrogen fertilizer plants was used in considerably larger quantities for welding. Under the Second Five-Year Plan, the by-product oxygen from these plants was already being used on a relatively extensive scale for enriching the air by means of which ammonia and nitrogen oxides are oxidized in the production of dilute nitric acid.

"At this time, intensive research and planning activities were begun with the aim of expanding the raw material base of the nitrogen industry, which was originally based on the intermittent gasification of coke and separation of the coking gas by the deep cooling method. Methods were investigated for the catalytic conversion of natural gas and of coke-oven gas into nitrogen-hydrogen mixtures. This included methods involving the application of pure oxygen and gasification of low-grade lignite and coke with the aid of pure oxygen. The possibilities were studied of applying oxygen in blast furnaces in combination with the production of gases for the synthesis of ammonia. The application of oxygen in the production of calcium carbide combined with the use of the gases obtained for the synthesis of ammonia or for organic synthesis was also subjected to investigation. Furthermore, work was done on the application of oxygen in the production of concentrated nitric acid by direct synthesis.

"Beginning with 1942, by-product oxygen was used more widely for technological applications.

"At about this time, the use of oxygen for increasing the conversion efficiency in the production of dilute nitric acid under pressure was begun. In 1944, a gas generator unit was started which supplied oxygen for the continuous gasification of coke in connection with the production of synthetic ammonia, with the result that the quantity of ammonia produced was considerably increased and the use of metallurgical

coke, which was in short supply, could be reduced. After World War II, oxygen was used more extensively, as can be seen from the fact that the use of oxygen for technological applications was 3.5 times larger in 1950 than in 1945 and 5.7 times larger in 1956 than in 1945.

"During the postwar years, broadening of the raw material base of the nitrogen industry was begun and this industry was combined with that of heavy organic synthesis. More economical technological processes which were further advanced from the technical standpoint and more efficient were developed.

"The discovery of new major occurrences of petroleum and natural gas in the USSR, the construction of a network of long-distance pipelines, and research, planning, and experimental work which had been done created the prerequisite for an extensive use under the Sixth Five-Year Plan of natural gas as a raw material for the production of ammonia. In addition to the waste gases of petroleum refining, natural gas forms the cheapest crude material for the production of ammonia."

In the text of the article the technological aspects of a number of processes are outlined which are based on the application of pure oxygen. Industrial procedures are discussed which will be introduced into the nitrogen industry of the USSR soon. The article discusses in some detail the gasification of lignites in a gas generator designed by GIAP (State Institute of the Nitrogen Industry), the continuous gasification of coke, the gasification of peat, the catalytic conversion of gaseous hydrocarbons by reacting them with oxygen and steam, the high-temperature conversion of hydrocarbon gases, the partial noncatalytic oxidation of mazut and petroleum, the low-temperature oxidation of the higher hydrocarbons of by-product petroleum gases, the production of acetylene from natural gas, and the use of oxygen in the production of nitric acid. The bibliography which follows the article lists 14 USSR references, one Italian reference, 3 German references, and an article contributed by an American (P. Sherwood) to a German periodical.

In the section on the gasification of lignite in the GIAP gas generator, the gasification of powdered lignite of low grade by a fluidized solids procedure is described. The procedures used are the water-gas process and the so-called semi-water-gas process [a combination of the generator and water-gas processes].

In the section on the continuous gasification of coke it is brought out that semiwater gas for the production of ammonia and water gas for the production of alcohols and hydrogen can be produced by the continuous gasification of coke if oxygen rather than air is used.

In the section on the gasification of peat it is pointed out that more than 60% of the world peat deposits are found in the USSR and that in some sections of the USSR which do not have any cheaper raw materials peat can be used as a raw material for the nitrogen industry. Data pertaining to the conversion of peat on a semiplant scale are given. A GIAP gas generator was used and methods of conversion with steam, air, and oxygen or steam and oxygen were applied.

In the part of the article which deals with the production of acetylene from natural gas, the conversion of methane and of other hydrocarbons into acetylene by combining the endothermic process of decomposition of methane into acetylene and hydrogen with exothermic reactions of the oxidation of methane with oxygen are described. Synthesis gas is a product of the thermocatalytic oxidation of methane into acetylene. This synthesis gas can be used for the production of ammonia, methyl or ischutyl alcohol, hydrogen, etc. It is stated that conversion of methane to acetylene will soon be applied extensively in the USSR chemical industry.

In the section on the use of oxygen in the production of nitric acid, the production of dilute nitric acid by the oxidation of ammonia with oxygen and the production of concentrated nitric acid by the oxidation of nitrogen oxides (derived from ammonia) are discussed. In the production of concentrated nitric acid, according to the description given in the article, ammonia is oxidized catalytically to NO by oxygen of the air. Subsequent oxidation of NO to NO_2 is also effected by oxygen of the air to the extent of 95%, while only 5% of the NO are oxidized with pure oxygen. The final stage of the process consists of the conversion of nitrogen tetroxide (N_2O_4) with oxygen in the presence of water under a pressure of 50 atmosphere gauge. At this stage pure oxygen plays the principal role in the process. The reaction which takes place proceeds according to the equation

$$2\,N_2O_4 + 2H_2O + 3O_2 = 4\,HNO_3$$

It is stated that the production of concentrated nitric acid by direct synthesis using oxygen is being applied extensively in the USSR nitrogen industry at present.

12. New Method for Synthesis of Organosilicon Fluorides

"A Method for the Preparation of Fluoroderivatives of Silicon, Tin, and Sulfur," by A. A. Yakubovich, S. P. Makarov, and V. A. Ginsburg; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 4, Apr 58, pp 1036-1038

The interaction of acetyl fluoride with alkoxy derivatives of Sn, Si, and S was investigated. It was found that there is substitution of alkoxy groups by fluorine, with the result that the corresponding fluoro-organoelemental compounds are formed.

13. Treatment of Central Asian Saline Waters With Ion-Exchange Resins

"The Problem of the Application of Ion-Exchange Resins for the Treatment of Salin Waters," by Ye. V. Shtannikov; Tashkent, Uzbekskiy Khimicheskiy Zhurnal No 1, Feb 58, pp 15-18

On the basis of experimental work that has been done, it is concluded that the ion-exchange resins Espatit-1 and EDE-10 can be used to advantage in the conversion of Central Asian saline waters to potable water. The salin waters treated in the work described contained on the average 6-7 grams of salt per liter and the salt content in some instances was as high as 10-11 grams per liter.

14. Properties of Ion-Exchange Membranes

"The Electrochemical Characteristics of Ion-Exchange Membranes," by V. A. Zarinskiy and Ya. M. Kots, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR, and Scientific Research Institute of Plastics, Ministry of Chemical Industry USSR; Moscow, Khimicheskaya Promyshlennost', No 2, Mar 58, pp 115-116

The electrical resistance and ion transfer numbers of 17 USSR cation-exchange and ion-exchange membranes have been determined in experimental work based on the electrolysis of KCl. It was established that the majority of the synthetic ion-exchange resins of which the membranes consisted are suitable for high-voltage electrolysis (up to a potential of 2,000 volts), because they do not deteriorate from the action of the heat developed in the process of electrolysis.

Nuclear Fuels and Reactor Construction Materials

15. Electrolytic Deposition of U, Np, Pu, and Am

"Electrolytic Deposition of Strong Layers of Uranium, Neptunium, Plutonium, and Americium," by G. I. Khlebnikov and Ye. P. Dergunov; Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 376-377

Procedures for the electrolytic deposition of thin, mechanically strong uranium, neptunium, plutonium, and americium layers in the preparation of targets to be bombarded in cyclotrons and other accelerators are described. In addition to being mechanically strong, such targets must stand intensive bombardment with heavy charged particles (N^{14}, Cl^{2}, O^{16}, and O^{18} ions) at a high density of these particles and also sharp fluctuations of the temperature (from room temperature to 500-700°). The procedures used, which are described in detail, involve deposition from aqueous solutions to which formic acid or ammonium oxalate has been added.

16. Methods for Determination of Thorium, Beryllium, and Lead Isotopes

"Methods for the Determination of the Absolute Age of Geological Formations," by V. I. Baranov, Doctor of Physicomathematical Sciences, and K. G. Knorre, Candidate of Geological-Mineralogical Sciences; Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 3, Mar 58, pp 112-113

The Commission on the Determination of the Absolute Age of Geological Formations at the Department of Geological-Geographical Sciences, Academy of Sciences USSR, conducted 10-14 December 1957 at Leningrad a symposium on methods for determining geological age. Some of the papers presented at the symposium dealt with analytical procedures for the determination of radioactive elements in connection with work of this type.

The method for the determination of microquantities of thorium with the application of V. I. Kuznetsov's "thoron" reagent was considerably improved at the Radium Institute imeni V. G. Khlopin. By selecting optimum conditions, the absolute error in the determination of thorium can be brought down to $\pm$ 0.3 γ. By making determinations at two different acidity levels, it was possible to eliminate the effect of rare-earth elements on the results.

The participants in the symposium heard the abstract of a communication by Peters and Arnold concerning work done by these investigators outside the USSR on the beryllium method for the determination of the age of marine deposits. They conducted this work on samples of red clays, in

which they expected to find the greatest accumulations of beryllium. The results obtained are preliminary, because a sufficiently precise method for the quantitative determination of beryllium has not yet been devised.

A number of reports discussed the use of glauconite for the determination of the age of alluvial rocks. Furthermore, the ionium method for the determination of the age of marine deposits was described. A method involving the determination of radioactive carbon with the aid of liquid scintillators, which had been developed at the Radium Institute, attracted considerable attention.

Of great interest is research on the isotope composition of lead contained in radioactive minerals, which was initiated by a team of workers at the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy and has been expanded during recent years. The results reported at the symposium indicate that it is possible to detect in radioactive minerals lead corresponding to different ages of these minerals.

A report by E. V. Sobotovich and other workers at the Radium Institute described attempts to investigate the type of lead contained in radioactive minerals by distillation and selective extraction of lead isotopes by the treatment of the minerals with different reagents.

17. Books on Structural Materials for Protection Against Radiation From Nuclear Reactors

Moscow, Sovetskiye Knigi, No 171, 1957, pp 32-33

The following books on materials used for biological protection against radiation from nuclear reactors are described:

Zashchitnyye Svoystva Stroitel'nykh Materialov, Primenyayemykh pri Sooruzhenii Yadernykh Reaktorov i Uskoritelev (Protective Properties of Structural Materials Used for Construction of Nuclear Reactors and Accelerators), by A. N. Komarovskiy, Atomizdat, first quarter of 1958.

"Gives experimental data on the protection against radioactive radiations of various structural materials used for the biological shielding of nuclear reactors and accelerators and related equipment. Prepared for atomic energy specialists."

Spetsial'nyye Stroitel'nyye Materialy, Primenyayemyye dlva Biologicheskov Zashchity Yadernykh Reaktorov i Uskoriteley (Special Structural Materials Used for the Biological Shielding of Nuclear Reactors and Accelerators), by A. N. Komarovskiy, Atomizdat, first quarter of 1958.

"Presents numerous data from Soviet and foreign practice and research on special structural materials used in construction of nuclear reactors and accelerators. The physicotechnical properties of these materials, their technology, and the characteristics of the work in the laying of heavy and hydrated concrete are discussed. Prepared for atomic energy specialists."

[For additional information on the chemistry and technology of nuclear fuels and reactor construction materials, see Item No 104.]

Organic

18. Addition of Trialkylphosphites to Conjugated Systems

"Addition of Complete Esters of Phosphorous and Phosphonic Acids to Conjugated Systems. V. Concerning the Reaction Mechanism of Trialkylphosphites With Conjugated Systems," by V. A. Kukhtin and Gil'm Kamay, Kazan Chemicotechnological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 5, May 58, pp 1196-1200

The effect of solvents on the reaction of tributylphosphite with methacrylic acid was investigated, and it was established that polar solvents accelerate this reaction. Conjugated reactions of trialkylphosphites with alpha, beta-unsaturated acids and alkyl halides were also studied. Simultaneous reaction products were isolated and a scheme for the reaction is proposed.

19. Esters of Phosphonic and Thiophosphonic Acids Synthesized

"New Method for the Synthesis of Esters of Phosphonic and Thiophosphonic Acids. XXIX. Addition of Dialkylphosphorous Acids to Esters of Vinylacrylic and Sorbic Acids and to 3,5-Heptadiene-one-2," by A. N. Pudovik and I. V. Konovalova, Kazan State University; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 5, May 58, pp 1208-1211

An investigation was made of the addition of dimethylphosphorous and diethylphosphorous acids to the following diene systems activated by electronegative groups: ethyl esters of beta-vinylacrylic, sorbic, and butadienephosphonic acids and to heptadiene-3, 5-one-2.

20. Triaroxyphosphazoacyl Compounds

"Triaroxyphosphazoacyls," by A. V. Kirsanov, G. I. Derkach, and R. G. Makitra, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 5, May 58, pp 1227-1232

Triaroxyphosphazoacyl compounds of the aromatic series were prepared. Trimethoxyphosphazo-3,5-dinitrobenzoly was also prepared and some of the chemical properties of these compounds studied.

21. Cholinesterase Inhibiters Increase Action of Dithilin

"The Effect of Various Medicinals on the Action of Dithilin," by A. F. Danilov, Fiziol. Rol' Atsetilkholina i Izyskaniye Novykh Lekarstv. Veshchestv (Physiological Role of Acetylcholine and the Search for New Medicinals), Leningrad, 1957, pp 406-413 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 1958, Abstract No 10714)

"Cholinesterase inhibiters (prozerine, phosphacol) increase the action of dithilin. Intravenous injection of morphine, atropine, and scopolamine increase the action of dithilin by over 15%. Adenoline is an antagonist to dithilin."

22. Improved Synthesis of Phenyldichlorophosphine

"Improved Methods of Synthesis of Phenyldichlorophosphine and Phenylphosphonic Acid Dichloride," by Ye. L. Gefter, Scientific Research Institute of Plastics; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 5, May 58, pp 1338-1340

Relatively simple methods were worked out for the synthesis of phenyldichlorophosphine and phenylphosphonic acid dichloride with yields of about 90% of the theoretical.

23. New Method for Synthesis of Unsymmetric Dialkylhydrazines

"Synthesis of Unsymmetric Dialkylhydrazines," by B. V. Ioffe, Chemical Institute, Leningrad State University; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 5, May 58, pp 1296-1302

The easiest method for the synthesis of unsymmetric disubstituted hydrazines is by the reduction of nitrosamines with a large excess of zinc dust in acetic acid. A preparative procedure that has been worked out in

detail is available only for dimethylhydrazine; however, this method has also been applied for the preparation of diethylhydrazine and (with somewhat worse results) for the preparation of the simplest aromatic hydrazines. Attempts to synthesize mixed unsymmetric aliphatic hydrazines by this method were unsuccessful.

A simple procedure is proposed for the synthesis of dialkylhydrazines by the reduction of nitrosamines with zinc amalgam in hydrochloric acid. The following homologs of unsymmetric dimethylhydrazine have been synthesized by this method and characterized by determining their physical constants: diethylhydrazine, di-n-propylhydrazine, di-n-butylhydrazine, methyl-n-butylhydrazine, methylisobutylhydrazine, methyl-n-propylhydrazine, and methylisopropylhydrazine. The last two substances are described for the first time.

It was found that with increasing size of the alkyl radicals the yield of hydrazines drops to some extent, while the yield of by-products (secondary amines) increases.

When methylphenylnitrosoamine is reduced by the procedure described, methylaniline is obtained.

Radiation Chemistry

24. Effect of Fast Electrons on Ethylene

"Transformations of Organic Compounds Caused by High-Energy Radiation; Part 3 -- Transformations of Ethylene Due to the Effect of Fast Electrons," by B. M. Mikhaylov, V. G. Kiselev, and V. S. Bogdanov, Institute of Organic Chemistry imeni N. D. Zelinskiy, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 58, pp 545-549

The following results were obtained in the experimental work described:

As a result of radiolysis ethylene is transformed mainly into butane, acetylene, and liquid hydrocarbons. In addition to butane and acetylene, the gaseous products of the reaction contain small quantities of CH_4, C_2H_6, C_4H_8, and H_2, as well as traces of propene. The liquid products which boil up to 130° consist of C_6 and C_8 aliphatic hydrocarbons. The higher-boiling fractions contain considerable quantities of aromatic and unsaturated hydrocarbons. The formation of butane, hexanes, octanes, and other higher alkanes takes place by the mutual condensation of aliphatic biradicals with an even number of carbon atoms. This condensation is followed by hydrogenation.

The energy yield of the reaction [G value] is 16 molecules per 100 eV.

Lowering of the initial pressure increases the degree of decomposition of ethylene without affecting the qualitative course of the reaction. Dilution of the ethylene with nitrogen results in increased conversion and a sharp lowering of the yield of gaseous hydrocarbons. Dilution with hydrogen has practically no effect on the radiolysis of ethylene.

25. Interaction Between Deuterium Molecules and Solid Hydrocarbon Polymers Under Effect of Nuclear Radiation

"Isotope Exchange Between Gaseous Hydrogen and Solid Polymers Under the Action of Nuclear Radiation," by Ya. M. Varshavskiy, G. Ya. Vasil'yev, V. L. Karpov, Yu. S. Lazurkin, and I. Ya. Petrov; Moscow, Doklady Akademii Nauk SSSR, Vol 118, No 2, 11 Jan 58, pp 315-316

When hydrocarbon polymers are subjected to the action of nuclear radiation, gaseous products consisting chiefly of hydrogen are evolved. To establish whether or not this process is reversible, i.e., whether hydrogen from the gaseous phase reacts chemically with the polymer and is retained by it, the interaction of gaseous deuterium with a number of polymers (polyethylene, polypropylene, polystyrene, butadiene rubber and polymethylmethacrylate) was investigated. The greatest quantity of deuterium was found to enter into chemical combination with polyethylene and polypropylene. Isotopic exchange proceeds at a slower rate in the cases of polybutadiene and polystyrene and no exchange at all was observed in the case of polymethylmethacrylate. There is either a chain reaction between polymer radicals and deuterium molecules or isotopic exchange between these radicals and deuterium. Comparison of the rate of isotopic exchange of polybutadiene with that of polyethylene shows that addition of hydrogen at double bonds apparently does not take place. The low rate of exchange in the case of polystyrene can be explained by the high radiation stability of this substance, i.e., the low yield of radicals formed from it.

26. Use of Radioactive Isotopes for Investigation of Intercrystalline Adsorption

"Use of Radioactive Tracers to Solve Problems of Adsorption at Internal Surfaces of Solid Bodies," by V. I. Arkharov, S. M. Klotsman, and A. N. Timofeyev; Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 380-381

On the basis of work done by V. I. Arkharov, S. M. Klotsmann, A. N. Timofeyev, and others, interrelationships between intercrystalline absorption of radioactive tracer atoms and dispersion of radiation on the one hand and intercrystalline adsorption of tracer atoms and diffusion of these atoms (both along grain boundaries and within grains) on the other hand are discussed from the standpoint of applications of the tracer method in the study of internal (intercrystalline) adsorption phenomena and the investigation of the grain structure of alloys. According to the bibliographic references given, the work described was done mainly at the Institute of Physical Metallurgy, Ural Affiliate of the Academy of Sciences USSR.

27. Radiochemical Investigation by USSR Antarctic Expedition of Rate of Deposition of Silt in Indian Ocean

"The Rate of Silt Deposition in the Indian Ocean," by V. I. Baranov and L. A. Kuz'mina, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR, Moscow, Geokhimiya, No 2, Apr 58, pp 99-106

The First Soviet Antarctic Expedition (1956) investigated an extensive area of the Antarctic shore, the Tasmanian Sea, and the Indian Ocean. One of the subjects of the investigation conducted was the rate of deposition of bottom silt. This rate was determined on the basis of the change of the ionium concentration with the depth of the silt layer. The ionium concentration and also the thorium concentration were determined in samples taken from the bottom by means of a core sampling device. A method developed by the authors of the article was used in determining these two elements. By using a luminescence method, uranium was also determined in the silt samples. The contents of uranium and thorium were correlated with those of magnesium and iron. The results obtained are discussed in some detail.

28. Determination of Solubility With Aid of Nonisotopic Tracers

"Solubility Determination of Difficultly Soluble Compounds Using Radioactive Tracers of Similar Elements," by N. B. Mikheyev; Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 354-358

The relationships have been established which govern the transfer into solution of microelements present in the form of compounds that are truly isomorphous with the compounds of macroelements when there is partial dissolution of the solid phase that contains the microelement. A method has been developed for determining the solubility of difficultly soluble compounds with the aid of radioactive tracer compounds which exhibit true isomorphism with the compound investigated, but contain a tracer which is not isotopic with the similar element of this compound. The effect which the degree of thermodynamic equilibrium between the precipitate and the saturated solution has on the type of curves used for the determination of solubility has been studied. A method has been proposed for the determination of the solubility of difficultly soluble compounds in solutions which contain the same ions. The relationships that were established could be confirmed using as examples the determination of the solubility of barium sulphate using Sr^{90} and of the solubility of potassium chloroplatinate using Cs^{134}.

Miscellaneous

29. Aerosol Dispersal by Helicopter

"Testing of Helicopter With an Aerosol Generator," by V. F. Dunskiy and A. F. Funikov; Moscow, Zashchita Rasteniy ot Vrediteley i Bolezney, No 3, May/Jun 58, pp 20-21

Type AG-16 aerosol generators have not been used in agricultural aviation because they do not produce a strong enough stream for the speed of the airplane. More powerful aerosol generators have not yet been developed. However, since the introduction of helicopters to agricultural aviation, new possibilities for the aerial dispersal of aerosols have been created.

The advantages of a helicopter are that it has a much slower speed and a strong downdraft forcing the aerosol down and around the plants, and that it can be used to spray plants growing on hillsides.

III. ELECTRONICS

Communications

30. Plans for Future Development of Radio Communications

"Development of Radio Communications, Radio Broadcasting and TV Broadcasting" (unsigned article); Moscow, Radiotekhnika, No 5, May 58, pp 3-6

The completion of the wire broadcasting system embracing all of the territory of the USSR is planned for the 1959-1965 period. After this system has been completed, each family will have service of either a radio receiver or a wired loudspeaker outlet. The number of radio receivers and wired radio outlets in the USSR should be increased to 25-30 per 100 persons, as compared to the present of 15 per 100.

The basic drawbacks of the wire-broadcasting system have been overcome recently by the improved production of semiconductors, miniature parts and printed circuits, thus greatly increasing the prospects for the development of efficient multiprogram wire-broadcasting systems.

During the same period, a great number of older radio broadcasting stations will be reconstructed to operate on a more efficient system of anode (plate) or auto-anode modulation. Steps will be taken to initiate two-program broadcasting from Moscow to Leningrad, Kuybyshev, Chelyabinsk, Minsk, Riga, Tallin, Khar'kov, Gor'kiy, and other towns utilizing low-frequency cables.

At present, more than 40 TV broadcasting centers and retransmitting stations are in operation in the USSR, and about 60 more such centers and stations are in the process of construction or planning. A number of trunk and local republic radio-relay lines are planned for the same period.

Construction of a radio-relay line to accommodate several hundred telephone channels and one TV channel will be started in the near future from Moscow in the southern direction. A similar powerful radio-relay line will be built in the direction of the Urals. During the same period, an expansion will be undertaken of intraoblast and intrarayon networks communications in Siberia, the Far North, Kazakhstan, and the Far East, where the radio communication is often the only means of communication.

During 1959-1965, a series of studies will be conducted to develop new efficient communication systems; the exact scientific and technical approach to such problems has not yet been fully established. Theoretical and experimental investigations in building multichannel communication systems utilizing waveguide lines now point to the feasibility of waveguides as reliable transmission ducts for thousands of communication channels.

The most important problems of the future will be the mastery of the millimeter wave technique and the development of efficient flexible waveguides and multiplex equipment.

31. New Radio-Relay Equipment

"Radio-Relay Equipment 'Vesna'" (unsigned article); Moscow, Vestnik Svyazi, No 3, Mar 58, cover page 2

The Scientific Research Institute of the Ministry of Communications USSR has developed new "Vesna" radio-relay equipment intended for use on radio-relay stations for lines up to 5,000 km.

The equipment will be manufactured in two models and will operate in frequency range of about 4,000 Mc. The first model will operate with three main trunks and one service duplex trunk; each main trunk will accommodate up to 240 telephone channels and two radio programs or one TV program.

The second model will operate with five main trunks, one reserve trunk and one service trunk; each main trunk will accommodate up to 600 telephone channels and two radio programs or one TV program.

32. Multichannel System of Wire Broadcasting

"To Speed-up the Development and Application of Multichannel System of Wire Broadcasting," by O. V. Yefinov; Moscow, Vestnik Svyazi, No 3, Mar 58, pp 8-9

The article contains the following passages:

> "In our country, there has been continuous development and improvement of multiprogram broadcasting which utilizes both the "over the air" broadcasting system, comprising some long- and medium-wave broadcasting stations, as well as ultrashort-wave broadcasting utilizing the TV networks. At present, in a greater part of our country two-republic program reception is possible.

"If we take into account the fact that wire broadcasting and radio broadcasting in the USSR should mutually supplement each other, then it will become evident that intensive work is required in the development and application of the multichannel wire broadcasting.

"In 1955-1956, the Ministry of Communications USSR again resumed research in the field of multichannel wire broadcasting. The Scientific Research Institute of the Ministry of Communications USSR was entrusted with the responsibility of developing a system capable of transmitting several communication channels over the same wires."

"The following carrier frequencies were adopted: for the second program 46 kc (operating band 40-52 kc) and for the third program 78 kc (operating band 72-84 kc).

"Plans have been made to organize, this year, in both Moscow and Kiev, experimental stations for three-channel wire broadcasting.

"However, the majority of wire broadcasting stations still remain single-program stations."

33. Reduction of Noise in Radiotelephone Reception

"Increasing the Noise Immunity of Reception by Limiting the Derivative Envelope," by N. F. Vollerner; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy - Radiotekhnika, No 2, Mar/Apr 58, pp 157-165

The problems associated with decreasing noise interference in the reception of AM radiotelephone programs are discussed. A number of known methods for increasing noise immunity are examined and criticized.

The author suggests using the difference between the shape (that is, the steepness of the wave front or derivative envelope) of the signal envelope and the noise envelope. It was discovered that it is possible to decrease the speed of rise and fall of the noise envelope to a minimum, providing an undistorted reproduction of the radiotelephone transmission.

A series of curves is given showing signals limited according to their derivative sinusoidal envelope for various levels of derivative envelope.

Two methods are proposed for limiting the derivative envelope in radio receivers -- control of amplification in relation to the level of the derivative (by the use of negative feedback), and direct limiting of the differentiated envelope.

In conclusion it is stated that selectivity using the derivative envelope is a more accurate method for reducing noise interference in radiotelephone programs, and may reduce the noise level by 5 to 7 db in comparison with amplitude limiting.

34. Analysis of Modulation and Demodulation

"The Amplitude and Frequency of a Modulated Carrier Wave," by A. Ditl, A. S. Popovs, Research Institute for Communications Engineering, Prague; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 66, No 5, Mar 58, pp 160-167

The article shows that, if the processes of modulation and demodulation can be idealized in certain points, mathematical expressions can be found, which in a formal sense, are not much more complicated than the expressions which describe a linear signal distortion. It is further shown that from these expressions general conclusions can be drawn regarding various types of modulation.

Examples include: single sideband amplitude modulation with and without a carrier wave; the influence of a brief interference pulse on the output signal in the case of frequency modulation; the packing effect of frequency modulation; and the influence of a reflected wave on the output signal in the case of frequency modulation.

35. Facsimile Machine FTAP

"Facsimile Machine FTAP," unsigned article; Moscow, Vestnik Svyazi, No 3, Mar 58, cover page

The facsimile machine FTAP was developed in the USSR for intraregion and intracity communication. The image is recorded on a roll of electrochemical paper 220 mm wide. The speed of transmission is 120 lines per minute. It requires 12 minutes to record a 220 mm by 300 mm image. The FTAP machine uses 127- or 220-volt alternating current. The lower consumption is about 370 w.

Components

36. High-Quality Precision Quartz Resonator

"High-Quality Precision Resonator With Slight Temperature Dependence," by I. G. Vasin, P. G. Pozdnyakov and M. I. Yaroslavskiy; Moscow, Doklady Akademii Nauk SSR, Vol 119, No 3, 21 Mar 58, pp 481-483

An AT-cut double-convex quartz lens was used by the authors in building a precision resonator for an operating frequency of 1 Mc. To increase the ruggedness of the resonator, the crystal was mounted by soldering it to two strung wires which also serve as current conductors. Soldering was accomplished by burning dots of colloidal silver into the crystal surface. Such a construction reduced the equivalent resistance of the resonator to 2-6 ohms.

After a series of experiments, it was established that high electrical parameters can be obtained by using 31.5 mm diameter lenses of 150-mm curvature. The crystals used in this experiment were, in most cases, only ground, resulting in a quality factor of $2 \cdot 10^6$ and higher. Polishing of the crystals further increases the quality factor. The tuned resonators were sealed in glass envelopes and filled with helium at 5 mm Hg pressure after evacuation. The helium gas reduced the quality factor of the resonator, but greatly increased its heat dissipating power.

The aging characteristics of this type of resonator have not yet been fully established.

Computers

37. Information Machine With Large, High-Speed Permanent Memory

"A Machine-Bibliographer," by K. Drugov; Moscow, Nauka i Zhizn, No 5, May 58, p 68

"Hundreds of books and thousands of articles on the most varied branches of knowledge are printed yearly and go into book repositories. A special index card is prepared for each book bearing, besides title and author's name...the subject, problems dealt with by the author, conclusions, and other data. This card makes it possible to gain rather complete information on each 'printed unit' even before one becomes directly familiar with it. Even so, a very great amount of time is wasted in selecting literature on a specific problem.

"The Laboratory of Electromodeling, Academy of Sciences USSR, is designing a special information machine. It consists of a large, high-speed 'memory' ('library'), a 'reading' device (for 'scanning' and processing the information), devices for input of information (they perform both machine translation from a foreign language and 'translation into the machine language' -- coding).

"A basic characteristic and virtue of the new information machine is the permanent, high-speed, machine 'memory.' The content of information material is applied in the form of capacitances on metallized printed sheets which are subsequently compressed into blocks. Since this machine, unlike those which have been built up to the present, has no mechanically moving parts, it is capable of operating for a long time at an information reproduction rate heretofore unattainable.

"When an inquiry is entered the machine codes it and develops an information search program. The 'reading' device, following the program, selects the needed material and processes it.

"When selection and processing of the material has been completed, the machine feeds the material out for printing on output printing mechanisms.

"The length of time taken for recording and computing is of the order of 6 to 10 millionths of a second. Contactless relay elements provide for 300,000 operations per second. More than a billion cells make up the permanent 'memory' of the machine; its 'reading' rate is about a million pages of information per hour."

An illustration accompanying the above article shows three line drawings: A perforator for registering information on the sheets; a block ("book") of 512 sheets ("pages") each containing 512 binary symbols; a single cassette which, for purposes of size comparison, is shown in juxtaposition to a cathode-ray tube unit and a cigarette lighter.

[SIR Note: The cassette in the illustration is not further described. It is possibly a segment of a ferrite core memory used for temporary information storage during machine operation.]

Electromagnetic Wave Propagation

38. Probability Density and Spectrum of Stationary Processes

"On Measuring the Probability Density and Spectrum of Stationary Time Processes," by P. Fey; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 66, No 5, Mar 58, pp 141-142

The reasons are given for the limited resolution in the measurement of the spectrum and probability density of stationary time processes. The integral equation which describes the relationship between actual and measured values is given and solved. The possibility of obtaining a solution through electrical analogy is pointed out. A simple example is used to illustrate the relationships. The author expresses thanks to Prof Dr Engr H. Fruehauf, director of the Institute for High-Frequency Engineering and Electron Tubes, Dresden Technische Hochschule, for guidance.

39. A New Balanced Mixer With Greater Stability

"A New Balanced Mixer for the Centimeter Wave Band," by Yu. Ya. Yurov; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, No 1, Jan/Feb 58, pp 82-88

A new balanced mixer is described which has, in comparison with existing mixers, greater decoupling, higher stability, and smaller dimensions. The mixer is a rectangular cavity in which the local oscillator excites a type 0, 1, 2 field, and the incoming signal excites a type 0, 2, 1 field. Narrow resonant slots serve as the connection between the cavity and the waveguides. Two detectors are arranged symmetrically relative to the axis of the cavity, parallel to the zero reference line, so that the electric fields of the signal have identical directions and those of the local source have opposite directions. The detectors are terminated with sections of coaxial line having movable plungers for tuning. Three tuning rods are located at the corners and in the center of the cavity for the purpose of increasing decoupling between the channels. As a result, stable decoupling reaches a value of 40-50 db.

"In analyzing the processes within the mixer, a method is suggested for computing fields of higher modes originating near thin conductors and narrow slots in waveguides and cavities. The local fields around these fields are considered as being similar to fields of a first approximation, originating around thin wire and slot antennas in free space. With this method it is possible to compute the return loss and to determine the conditions for matching the proposed mixer with a rectangular waveguide."

40. Rectangular Waveguides With Attenuating Structures

"Choice of Parameters of an Attenuating Ridge Structure in a Rectangular Waveguide According to Given Electromagnetic Parameters," by N. V. Trunova; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy - Radiotekhnika, No 2, Mar/Apr 58, pp 141-148

"A series of curves is given which enables one to select the dimensions of a rectangular waveguide with a double ridge-type structure used as an attenuator in a traveling-wave tube, according to given values of maximum operating frequency, power, and efficiency of the tube."

Graphs are computed for the frequency amplification band at a fixed plate voltage. A comparison of synphase and antiphase waves is made, and the data, including waveguide dimensions, are included in graphs.

"It is seen from the data that for high-power traveling-wave tubes with a large amplification factor and a tuning band of less than 5%, it is preferable to use synphase waves."

41. Examination of Auto-Oscillations in Traveling-Wave Tube

"Traveling-Wave Tube as an Oscillator," by G. N. Rapaport; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy - Radiotekhnika, No 2, Mar/Apr 58, pp 202-208

Auto-oscillation is examined in a traveling-wave tube with positive dispersion of the delay system and feedback in the reflected wave. It is found that for optimum parameter values the electron efficiency of the tube in standing-wave systems may reach 33%. The power of a self-oscillating tube in a standing-wave system with small gain parameter and strong feedback may be considerably higher than the saturation power in an amplification system.

"It is experimentally and theoretically proven that oscillations of a definite order are more readily generated in a standing-wave system if the electron velocity is increased somewhat above the velocity of the wave; the greater the length of the tube, the less need be this increase.

"As in backward-wave oscillators, the starting current of the oscillator in a traveling-wave tube in a standing-wave system is inversely proportional to the cube of the length of the system."

42. New Linear Electron Accelerator

"A Linear 6-mev Electron Accelerator," by O. A. Val'dner, O. S. Milovanov, G. A. Tyagunov, and A. V. Shal'nov; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy - Radiotekhnika, No 2, Mar/Apr 58, pp 222-230

Gives the general principles of operation and construction of electron accelerators. The 6-mev accelerator described consists of two separate sections -- a buncher in which the phase velocity changes from $\beta = 0.4$ to $\beta = 0.97$, and an accelerator where the phase velocity is constant and equal to the speed of light $\beta = 1$.

The first section of the accelerating waveguide is made of a seamless copper tube having an inner diameter of 90 mm. Diaphragms are made of copper and are mounted in the waveguide by a thermal-shrinkage method using liquid nitrogen. The second section is made of separate rings and diaphragms. A tolerance of $\pm$ 0.02 mm is used for all dimensions of the accelerating waveguide sections.

Power loss in the high-frequency tract of the accelerator is 4 db. The pass band of the matched waveguide of the accelerator is 6 Mc for a standing-wave coefficient of not more than 1.3.

The fundamental technical characteristics of the accelerator were obtained experimentally.

A number of applications are suggested for linear electron accelerators, among which are the generation of millimeter waves, industrial radiography, and in medicine.

43. Equations for Irregular Waveguides With Nonhomogeneous Medium

"Waveguide Equations for Irregular Waveguides," by B. F. Yemelin; Moscow, Radiotekhnika i Elektronika, Vol III, No 5, May 58, pp 615-627

Waveguide equations are derived which are applicable to waveguides having changing cross-sections, curved axes, and twisted surfaces as well as to those classes of waveguides having all three irregularities simultaneously with a nonhomogeneous medium.

The equations are an infinite system of ordinary linear differential equations for the amplitudes of coupled E- and H-waves. The equations are relatively simple and facilitate the study of irregularities in waveguides produced by an anisotropic medium.

44. Wave Propagation in Partially Filled Regular Waveguides

"On the Question of Wave Propagation in Waveguides Filled With a Medium of Variable Permitivity and Permeability," by V. B. Brodskiy; Moscow, Radiotekhnika i Elektronika, Vol III, No 5, May 58, pp 628-633

A regular waveguide is examined which is partially filled with an isotropic medium having permitivity and permeability which are given functions of coordinates. The problem of wave propagation in such a waveguide is solved by means of an expansion of the individual functions of an empty waveguide, whereupon a system of linear differential equations of the first order is obtained for the expansion factors.

An analogous problem is solved for cavity resonators filled with a similar medium.

45. Examination of Wave Propagation in Bent Waveguides

"Waves in Bent Tubes," by A. G. Sveshnikov; Moscow, Radiotekhnika i Elektronika, Vol III, No 5, May 58, pp 641-648

An approximate method is given for solving problems of propagation of acoustical waves in waveguides having arbitrary changes in direction and slightly deformed cross-sections. This method is also applied to the propagation of electromagnetic waves in twisted rectangular waveguides with constant cross-section using a curvilinear system of coordinates.

46. Device for Measuring Small Time Intervals

"Device for Measuring Microsecond Time Intervals," by B. A. Predein; Moscow, Pribory i Tekhnika Eksperimenta, No 2, Mar/Apr 58, pp 31-36

The article describes a device, designated as IV-0.1, capable of measuring time intervals in the range from 5 to 256 microseconds with an accuracy of about ± 0.1 microsecond. The device utilizes simultaneously two methods of direct measurement of time: a method of oscillator-scaling circuit and the method of "measuring line" [delay line].

The instrument consists of a quartz controlled oscillator, a pulse shaping line, a measuring circuit in the form of an artificial delay line and a scalar circuit. The instrument IV-0.1 permits direct reading of short time intervals between two electric pulses on a luminescent indicator.

After a certain rearrangement of the measuring circuit, the sensitivity of the instrument can be raised to 10^{-9} seconds.

47. High-Voltage Ion Gun

"Ion Gun Operating at 20 to 30 Kilovolts," by L. N. Bukhovskaya; Moscow, Pribory i Tekhnika Eksperimenta, No 2, Mar/Apr 58, pp 49-51

The article describes the principle of operation and construction of a laboratory ion gun operating with a potential of 20 to 30 kv. A high-voltage discharge produces an ion beam in the instrument. This type of ion gun with ion-beam energy up to 35 kev is widely used in electron-optical devices.

The instrument, built by the author and P. V. Zaytsev, is made of a discharge chamber and a high-vacuum chamber separated by a diaphragm, through which the ion beam passes. In the discharge chamber a hollow anode and a stainless steel cylindrical cathode are mounted on a porcelain insulator. The opening in the cathode, through which the beam passes, should be sufficiently small to maintain a pressure of 10^{-1} mm Hg in the discharge chamber, while a high-vacuum of 10^{-4} mm Hg is maintained on the other side of the cathode. The ion-beam current should be of the order of 15 to 20 microamperes. The power supply to the gun is obtained from a high-voltage rectifier with a grounded negative terminal.

A series of experiments were carried out in order to determine the effect of ion irradiation on various metals.

Magnetic, Dielectric, Semiconductor Materials

48. Examination of Transfer Characteristics of Junction Transistors

"Transfer Characteristics of Semiconductor Triodes," by T. M. Agakhanyan; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy - Radiotekhnika, No 2, Mar/Apr 58, pp 194-201

The transfer characteristics of an ideal transistor are examined and the effect of impedance of a pulse generator at the input of the transistor is computed. Approximate equations are derived which characterize the parameters of an equivalent circuit of a real junction transistor.

"From an analysis of the processes in the region of the base of an ideal transistor, it follows that a decrease in the impedance of the oscillator results in a decrease in the delay time as well as in the rise time of the output pulse, whereas in real transistors a decrease in this impedance causes an increase in the rise time. The latter is a result of internal feedback which is due to the voltage drop throughout the distributed impedance of the base. Elimination of internal feedback by the use of neutralization circuits permits a decrease in pulse front distortion in circuits using semiconductor triodes."

49. Method for Determining Characteristics of Transistor Trigger Circuits

"An Analysis of Junction Transistor Trigger Circuits," by V. V. Chervetsov; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, No 1, Jan/Feb 58, pp 95-104

Because of the nonlinearity of transistor characteristics in pulse systems, it is often necessary to use methods of analysis based on the linearization of the static characteristics of transistors in three specific areas of operation. Each segment of the static characteristic of the transistor corresponds to a segment of the voltampere static characteristic of the circuit. Voltampere static characteristics which enable one to analyze the circuit in detail may be obtained experimentally or computed analytically.

Voltampere characteristics are computed for a trigger circuit with one and with two stable equilibrium positions, and these results are compared graphically with experimental results.

Amplitude and duration of pulse rise are also determined and a method for selecting the emitter impedance of a trigger circuit is given.

Radar

50. Radar Operating on Millimeter Waves

"Radars on Millimeter Waves," by I. Yur'ev; Moscow, Sovetskaya Aviatsiya, 6 Mar 58

The article, which does not identify the radar as Soviet or Western, contains the following passages:

"The described radar has a resolution of only 9 meters, which affords a "view" not only of individual aircraft but also of the tail assembly and thus the possibility of identifying the type of aircraft. It also permits

the tracking of an automobile as it turns from the road to the airfield, and of the driver as he steps out of the cab. However, the range of visibility of such an installation is small: the range indicator is designed for a distance of 0.5 to 16 kilometers.

"The peculiar feature of this radar is the use of two separate antennas, one for reception and one for transmission. Thus the necessity for a transmit-receive switch is eliminated, and the construction of the antenna-waveguide section is simplified; besides, the use of two antennas permits a reduction of the noise caused by rain approximately 3,200 times as great as that of stations having only one antenna.

"As is mentioned in some foreign literature, beside observations over the airfield surface, the millimeter range radars may be used as radio-detonators, identification systems, airborne intercepting stations, bomb and gun sights, etc."

IV. ENGINEERING

51. Soviet Improvement of Alkaline Battery Reported in Czechoslovak Press

"Improvement of Soviet Alkaline Batteries" (unsigned article); Prague, Obrana Lidu, 22 May 58, p 2

Alkaline storage batteries were improved in the Soviet Union by adding mercury to the nickle-oxide electodes. An even better electrochemical efficiency has been achieved by adding 3 percent powdered barium.

52. Large Deviations of Random Variables

"Concerning the Probability of Large Deviations of Random Variables," by I. N. Sanov; Moscow, Matematicheskiy Sbornik, Vol 42 (84), No 1, 1957, pp 11-44

"The problem concerning the determination of the probability for large deviations of random variables commands constant attention. Many important investigations devoted to this question exist of which we should name, above all, the works of N. V. Smirnov, H. Cramer, and V. V. Petrov. The problems concerning the probability estimate for large deviations of an empirical distribution curve of the random variable ξ after N independent selections from the theoretical distribution curve, as well as the problem concerning the probability estimate of large deviations of a random variable sample taken from a general set from the mean value of terms of a variation series, are closely related to this problem. Distributions of the so-called normal deviations in the two previous cases were obtained in the works of A. N. Kolmogorov and N. V. Smirnov.

"It is clearly shown that the notion of the integral $\int_{-\infty}^{+\infty} \ln(dF/d\phi)\,d\phi$ cited in the present work plays an important role in problems concerning large deviations. (This integral is defined for any two distribution functions $F(x)$ and $\phi(x)$.)

"In the work, a definite approach to the problem of large deviations for sufficiently large orders of these deviations is employed. For example, for deviations of a normalized number of m successes in N independent trials in a Bernoulli system with a probability of success in one trial p $(0 < p < 1)$ the following asymptotic expressions were obtained for the probabilities:

"$P\ (m-Np/\sqrt{Npq} \geq A)$, where A is a constant and $q = 1-p$ (the Laplace Integral Theorem).

"The asymptotic formulas for the probabilites in the works of N. V. Smirnov, H. Kramer, and V. V. Petrov were found to be

$$P\ (m-Np/\sqrt{Npq} \geq AN^{\alpha}), \text{ where } 0 < A, \quad 0 < \alpha < 1/2.$$

"In the present work, the following asymptotic formulas for the probability of a Bernoulli system are obtained:

$$P\ (m-Np/\sqrt{Npq} \geq \chi(N)), \text{ where } \chi(N) = O(N^{1/2}).$$

"For this reason, the methods developed in the present work must not be considered as a replacement of the methods indicated in the above works, but as a complement to these methods. The development of these methods to the point where they give all fundamental results of the above-mentioned investigations is, however, of great interest. It was stated that there exists a real possibility for accomplishing this. The value of such a method would rest in its single approach to an entire circle of diverse problems."

53. Spheroidal Functions

"Asymptotic Representations of Spheroidal Functions With an Azimuth Index $m = 1$," by M. G. Belkina; Moscow, Doklady Akademii Nauk SSSR, Vol 114, No 6, 1957, pp 1185-1188

"Let an equation be given of the form

$Y'' + c^2 p(\eta) Y = 0$, $c \gg 1$, where the function $p(\eta)$ has n first order poles and zeros at the points η_k. Further, let it be given to select a standard equation

$y'' + P(\varphi) y = 0$, for which the independent solutions $y_1(\varphi)$ and $y_2(\varphi)$ are known and where the poles and the zeros φ_k of the coefficient $P(\varphi)$ may be set in a reciprocal, single-valued, and monotonic correspondence with η_k such that poles correspond to poles and zeros to zeros of the same order. Then the asymptotic representation of the general solution of (1) is

$$Y(\eta) = \sqrt[4]{P[\varphi(\eta)]/p(\eta)}\{B_1 y_1[\varphi(\eta)] + B_2 y_2[\varphi(\eta)]\}$$

where the connection between the independent variables is given by

$$\int_{\varphi_k}^{\varphi} \sqrt{P(\varphi)}\, d\varphi = c \int_{\eta_k}^{\eta} \sqrt{p(\eta)}\, d\eta$$

and the additional conditions

$$\int_{\varphi_k}^{\varphi_i} \sqrt{P(\varphi)}\, d\varphi = c \int_{\eta_k}^{\eta_i} \sqrt{p(\eta)}\, d\eta \quad (i=1,2,\ldots, k-1, k+1,\ldots n).$$

"In the present work, the spheroidal functions of A. A. Dorodnitsyn, J. A. Stratton, P. M. Morse, L. J. Chu and R. A. Hutner were used to express the functions $Y(\eta)$.

"After the development which followed, values of

$x_\ell = \beta\ell + 1 - 2/c^2$ were calculated by the expressions of Airy, Bessel, and the expression developed in the paper and tabulated. The results of these calculations were then compared with the true value.

The expressions relating the above symbols are:

$A = -c^2 x - 2$, $p(\eta) = 1 + \beta/1 - \eta^2$, and $c = (\ell + 1)\pi/2$ for $(\beta - 0)$."

54. Automorphisms and Flows in Lesbegue Systems Found Nonisomorphic With Each Other According to Modulus 2

"A New Metric Invariant in Transient Dynamical Systems and Automorphisms in Lebesque Spaces," by Academician A. N. Kolmogorov; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 5, 1958, pp 861-864

"It is well known that a considerable part of the metric theory of dynamic systems may be presented as an abstract theory of flows $\{S_t\}$ in Lebesque spaces M with measure μ invariant in the terms in relation to isomorphisms according to modulus zero (see the survey work of V. A. Rokhlin, Usp. Matem. Nauk, 4, 2 (30), 1949, in which the presentation is similar in respect to definitions and notations). The measure on M we will presuppose normalized by the condition

$$\mu(m) = 1$$

and nontrivial (i.e., we presuppose the existence of a set $A \subseteq M$ with $0 < \mu(A) < 1$). Many examples of transient automorphisms and transient flows with a so-called multiple-counting Lesbegue spectrum are known (for automorphisms see (1) and section 4 of the present work, and for flows see (2)-(5)). From the spectral point of view we have here one type of automorphisms and one type of flows. The question of whether all the automorphisms of type $\mathcal{L}^\infty_0$ (corresponding to a flow of type $\mathcal{L}^\infty$) are isomorphic with each other according to modulus 2 has remained open till now. It is shown in sections 3 and 4 that the answer to that question is negative in the case of automorphisms, as well as in the case of flows. The new invariant permitting one to split up the class of automorphisms $\mathcal{L}^\infty_0$ and the class of currents $\mathcal{L}^\infty$ on a continuum of invariant subclasses is

entropic per unit of time. In section 1 the necessary data from the information theory are presented (the concepts introduced here concerning conditional entropy and conditional information and their properties probably have wider interest; although, the complete presentation immediately relates to the determination of an amount of information from (7) and to numerous works developing this definition). In section 2, the determination of the characteristic h is given and its invariance is proved. In sections 3-4, examples of automorphisms and flows are indicated with arbitrary values of h within the limits $0<h\leqslant\infty$. In the case of automorphisms the matter concerns examples long since constructed, while in the case of flows the construction of examples with finite h is a more delicate problem and is connected with certain curious problems concerning the theory of Markov processes.'

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55. Expansion Into Irreducible Representations of the Tensor Product of Infinite Dimensional Representations of the Lorenz Group

"On the Expansion of the Tensor Product of the Proper Lorenz Principal Group Series Representations Into Irreducible Representations," by M. A. Neymark; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 5, 1958, pp 872-875

"The expansion into irreducible representations of the tensor product of finite dimensional, irreducible representations of the Lorentz group is well known and employed in theoretical physics. The analogous question for infinite dimensional representations has as yet not been considered.

"The present work is devoted to the solution of this problem for the tensor product representing the proper principal series of the Lorentz group."

VI. MEDICINE

Contagious Diseases

56. Practical Use of Antirabies Gamma Globulin

Photo caption, Meditsinskiy Rabotnik, No 46, 10 Jun 58, p 4

The following caption appears under a photograph of electrophoresis equipment in this newspaper:

"A new preparation -- antirabies gamma globulin -- has been used and introduced into practice in public health work at the Moscow Scientific Research Institute of Vaccines and Sera imeni Mechnikov. In the photograph: in the gamma globulin laboratory of the production division, scientific associate M. N. Durasova (right) and senior chemist-laboratory technician A. A. Nikitenko carry out electrophoretic control of an alternate series of antirabies gamma globulin, which is at present manufactured by the institute on a production scale."

57. Clinical Picture of Q Fever in Armenian SSR

"Q Fever in the Armenian SSR," by M. Ye. Kotsinyan, Institute of Epidemiology and Hygiene, Ministry of Health, Armenian SSR; Moscow, Voprosy Virusologii, Vol 3, No 2, Mar/Apr 58, pp 105-107

"Q fever in humans in the Armenian SSR was first demonstrated serologically by us on one of the meat combines in 1954. Positive complement fixation reactions with Rickettsia burnetii antigen in dilutions of 1:4 - 1:6 were obtained in 17 of 52 blood sera investigated; a slight increase in titer was noted in subsequent investigations.

"Sheep were apparently the source of infection: the complement fixation reaction was positive in a dilution of 1:8 in one of five sheep examined. The possibility that Q fever was brought in from Turkey was established: the complement fixation reaction was positive in 22 of 213 imported cattle, sheep, and goats.

"Q fever in humans was observed in Basargecharskiy and Alaverdskiy rayons of the Armenian SSR in 1956. An outbreak in the village of S. in Alaverdskiy Rayon lasted 18-20 days and involved 62 persons. The onset of the disease was sudden and was accompanied by chills in the majority of cases; temperature

reaching 39-40° lasted 3-10 days. The patients complained of severe pain in the head, eyeballs, muscles of the extremities, and lumbar muscles; absence of appetite; general debility; and perspiration. Comparative bradycardia and moderate leukopenia were noted. The erythrocyte sedimentation rate was 10-30 mm.

"The complement fixation reaction was positive in 15 of 22 cases observed. An increase in titer (to 2-8 times the previous level) was observed after repeated investigation of four persons, and a negative reaction became positive in seven persons.

"Cattle were the source of infection: examination of the blood of 99 cattle yielded positive complement fixation reactions with titers of 1:4 and 1:8 in eight cases.

"One case of Q fever was observed in another village in the same rayon.

"A positive complement fixation reaction from one cow was obtained with a dilution of 1:10 in investigation of the blood of 17 cattle and 16 swine from Aginskiy Rayon for Q fever. Positive complement fixation reactions were also obtained in five cases on examination of blood sera of 228 cattle from Oktember'yanskiy Rayon.

"Positive results of serological investigations of animal sera with the complement fixation reaction in three rayons of the republic indicate that Q fever bears an endemic character in Armenia."

58. Virulence of Typhoid Fever Microorganisms Increases With Increased Duration in Irradiated Organisms

"The Influence of Irradiated Organisms on the Virulent Properties of Typhoid Fever Microorganisms," by G. A. Chokatilo; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 37-41

The aim of this research was to study the possibility of the change of virulence of typhoid fever microorganisms in irradiated guinea pigs. This problem is of interest for its theoretical and practical aspects. It is well known that the immunobiological resistance is significantly decreased in irradiated organisms and that infectious diseases during radiation sickness run an especially severe course.

A total of 49 guinea pigs (including 10 controls) were subjected to general X-ray irradiation effects by doses of 100, 200, and 300 r.

Results indicate that the virulence of typhoid fever microorganisms isolated from cutaneous foci of irradiated guinea pigs is higher than that of microorganisms isolated from cutaneous foci of unirradiated guinea pigs. This fact was evident in both DI_{50} and DL_{100}, and also in the increased percentage of mortality of mice inoculated by cultures from irradiated animals as compared with mice inoculated by cultures from non-irradiated animals.

The author considers that the increased degree of virulence of typhoid fever microorganisms isolated from irradiated organisms is not connected with the direct effect of irradiation, for although inoculation of the organisms was always done after their irradiation, the longer the microorganisms remained in the irradiated animals the more virulent they became.

Therefore, the increased virulence of microorganisms in irradiated animals must be due to the irradiation effects which act on the microorganisms through the irradiated organisms in which they exist.

Epidemiology

59. Hemorrhagic Nephroso-Nephritis in Yaroslavskaya Oblast

"Results of an Expedition Study of Hemorrhagic Nephroso-Nephritis in Yaroslavskaya Oblast," by A. D. Lebedev, Moscow Medical Institute imeni Sechenov; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 11, Nov 57, pp 129-136

The author of this article introduces his subject with references to work accomplished in the USSR and abroad during the past 10 years on diseases related to the hemorrhagic nephroso-nephritis group, which includes Omsk and Bukovinsk hemorrhagic fevers, tick-borne meningoencephalitis, two-wave milk fever, Crimean and Uzbek hemorrhagic fevers, Far Eastern nephroso-nephritis, and epidemic hemorrhagic fever. Epidemics of these diseases in various countries are mentioned. It is pointed out that not all diseases of the hemorrhagic nephroso-nephritis type can be completely identified due to the lack of adequate methods of culturing the viruses and insufficient study. The author suggests that all diseases of this type be classified in the general category of hemorrhagic nephroso-nephritis.

The article then presents results of an expedition study of the Yaroslavskaya Oblast focus of hemorrhagic nephroso-nephritis, initiated in the winter of 1949 and continued until 1957. From January 1954 to 1957, associates of the Chair of General Biology of the First Moscow Medical Institute carried out systematic, year-round observations on the epidemiology, etiology, and parasitology of the disease; associates of the Parasitological

Division of Yaroslavskaya Oblast Sanitary-Epidemiological Station also participated in this work, the results of which were partially published in 1954-1955. Only epidemiological data are given in this report. Figures 1 and 2 show seasonal incidence of hemorrhagic nephroso-nephritis in Yaroslavskaya Oblast, and fluctuations in incidence by year. Four tables summarize infection among the local population from 3 to 60 years old and above, infection among children according to sex, infection in populated points depending on their size, and results of the chicken erythrocyte hemolysis reaction.

The following conclusions are presented on the basis of the results obtained:

"1. Analysis of the data obtained in the observations confirm that infection of humans with the nephroso-nephritis virus occurs by a percutaneous route, i.e., through injured skin (or mucous membrane) on contact with fodder, wet [decomposed] straw, and other objects contaminated with excreta from rodent (or insect) carriers.

"2. Study of the role of ectoparasites of rodents and insects has not explained the existence of contagious routes of transmission of the virus to man.

"Comparison of epidemiological data with zoological-parasitological investigations also led to rejecting respiratory and alimentary routes of infecting humans.

"3. All the data accumulated substantiated the fact that the development of epidemic outbreaks of hemorrhagic nephroso-nephritis in Yaroslavskaya Oblast is dependent on seasonal migrations of rodents (and possibly insects).

"4. The aforementioned considerations permit an explanation of the characteristics of the epidemiology of hemorrhagic nephroso-nephritis in Yaroslavskaya Oblast: late autumn-winter seasonal character, the absence of group infection, greater infection of inhabitants of small villages, unusual infection of age groups, professions, etc.

"5. An increase in incidence beginning in 1943 was noted after every 5 years; the alternation with years of minimal incidence is just as regular. An increase in the number of small mammals was noted in epidemic years.

"6. Systematic deratization in small villages is the principle prophylactic measure in hemorrhagic nephroso-nephritis. Intensified deratization should be conducted in September and October. The development of methods of protecting small villages from infiltration of wild animals from natural habitats (plowed furrows with trap holes) is necessary."

60. Brucellosis Control

"Some Results of Scientific-Practical Work on Brucellosis Control," by P. A. Vershilova, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 10, Oct 57, pp 24-29

This article reviews the epidemiology and epizootology of brucellosis in the USSR from 1917 to the present. The work of several institutes on the control and eradication of this disease is mentioned, and expeditions into foci are reported. The author also covers the establishment of antibrucellosis stations throughout the country. A number of published works dealing with various aspects of brucellosis research are referenced. Classifications of Brucella based on serological criteria are presented, and the significance of dissociation percentage among atypical strains is discussed.

A brief discussion of methodology in brucellosis research, including the use of the electron microscope, is offered. According to this report, current work in progress at the Institute imeni Gamaleya includes studies of bacteriophage, modifiability of the brucellosis pathogen, antigenic structure, and methods of improving diagnostic techniques. New vaccine strains and chemical allergens and antigens for therapeutic purposes are being investigated at this institute.

Infectivity and morbidity among humans and animals with respect to abortus and melitensis types are correlated. In discussing routes of brucellosis transmission, Vershilova presents statistical evidence to support the assumption that ticks and fleas can be reservoirs of infection; he also implicates rodents in the chain of transmission. It is stated that persons occupationally connected with diseased animals run the greatest risk of infection.

Prophylaxis of brucellosis is discussed in connection with progressive eradication of the disease. On the basis of bacteriological, immunological, and histological studies, Soviet scientists have suggested the possibility of spontaneous eradication of brucellosis among animals as a result of increasing immunity; this same phenomenon has been seen to occur among humans who are not repeatedly exposed to the disease. The mechanism of development and the characteristics of immunity are discussed at length, with emphasis on humoral and phagocytic factors. The necessity for improving the effectiveness of vaccine prophylaxis by using live vaccines to produce immunity with a high degree of intensity is pointed out. Attenuated live cultures of Br. suis, melitensis, and abortus were observed to confer resistance to infection with virulent cultures in 75-100% of guinea pigs inoculated.

Brucella abortus strains 19-BA and M, (suitable for immunizing humans) and the vaccine processes they produce have been studied by bacteriological, immunological, histological, cytological, and histochemical methods; this process is described in detail. It is stated that a live dry vaccine prepared from strain Br. abortus 19-BA was produced on a mass scale in 1952-1953 at the Institute imeni Gamaleya and was issued for use in foci of melitensis-type brucellosis. A 5-year study of this vaccine has established its low reactogenicity, complete harmlessness, and high epidemiological effectiveness.

The advisability of reinoculation with live vaccine for persons who no longer exhibit positive seroallergic reactions is considered, taking into account the observation that subcutaneous revaccination sometimes causes violent reaction. Experimental inoculation of humans (1955-1957) demonstrated that the cutaneous method of revaccination was as successful as the subcutaneous, and eliminated the necessity for preliminary seroallergic testing.

The author presents the following paragraph in conclusion:

"The data presented indicate that vaccination against brucellosis with live vaccine brings about a significant decrease in morbidity among humans in melitensis-type foci, and its widespread use for prophylaxis of brucellosis is completely justified. It is also clear that any prophylactic measures for brucellosis cannot completely prevent fresh outbreaks of the disease if it is not eradicated among carriers of infection, primarily among sheep and goats. Extensive experimental vaccination of cattle and small livestock with live vaccine, initiated in recent years, reveals prospects for the complete eradication of brucellosis in the Soviet Union."

Hematology

61. Cobalt-60-Containing Vitamin B_{12} Method Differentiates Between Asymptomatic Pernicious Anemia and Sprue and Macrocytic Anemias

"The Phenomenon of Asymptomatic Pernicious Anemia and Sprue and the Differentiation Between Macrocytic Anemias by the Method of Measuring Hepatic Absorption of Vitamin B_{12} Containing Radioactive Cobalt," Polski Tygod. Lek., 1957, 2, 43-47 (Polish) (from Meditsinskiy Referativnyy Zhurnal, No 9, Section 1, Sep 57, p 55)

A method simpler than Castle's for diagnosing pernicious anemia and for differentiating between macrocytic anemias and anemias of other etiology, and sprue has been described. It is based on hepatic absorption of vitamin B_{12} which contains radioactive cobalt (Co^{60}).

The test consists of administering 0.5 milligram of vitamin B_{12} to the patient, and after 48 hours the elimination of unabsorbed radioactive vitamin is speeded and the radioactivity of the absorbed portion is measured over the hepatic area.

In cases of pernicious anemia and in sprue there is no accumulation of radioactive vitamin in the liver and no difference of radiation is registered, whereas in normal cases and in cases of macrocytic anemias radiation in the hepatic region is intensified. Additional information may be obtained by repeating the same method together with administering a preparation containing Castle's internal factor.

Results of cobalt-60-containing vitamin B_{12} indicate that this method is especially distinct for diagnosing pernicious anemia and sprue.

62. Mediums for Prolonged Storage of Cattle and Horse Blood Investigated

"New Optimum Mediums for the Prolonged Storage of Preserved Cattle and Horse Blood," by L. A. Lebedev and V. M. Sazonov, Omsk Veterinary Institute; Moscow, Veterinariya, No 5, May 58, pp 90-97

The purpose of the work was as follows:

1. To study the changes in the physicochemical properties, the biochemical and morphological composition of preserved cattle and horse blood, and to determine the effect of various preservative solutions on the intensity of the changes in these blood indexes.

2. To determine, on the basis of the collected data, the best preservative medium for the prolonged storage of cattle and horse blood in order to recommend these solutions for wider use in veterinary practice.

Twenty-three solutions were investigated. Of these, acid glucose-citrate solutions, on the basis of the data collected, were considered optimum mediums for the prolonged storage of the blood.

63. Apparatus for Artificial Circulation

"Apparatus for Artificial Circulation," by Ye. A. Vaynrib, Ye. A. Frid, L. N. Martynov, M. G. Anan'yev, S. A. Mushegyan, and L. A. Levitskaya, Scientific Research Institute of Experimental Surgical Apparatus and Instruments; Moscow, Meditsinskaya Promyshlennost' SSSR, No 12, Dec 57, pp 50-55

An apparatus for artificial circulation has been designed by the Scientific Research Institute of Experimental Surgical Apparatus and Instruments. It consists of a physiological unit, a hydromechanical unit, a pressure control system, a system for warming the blood, and an electric supply system. The apparatus is equipped with a pair of perfusion pumps which transfer the blood from the veins to the arteries via artificial lungs. Blood is saturated with oxygen in the artificial lungs by creating a turbulently moving blood foam which increases the blood surface and ensures 100% oxygenation.

Description of the various parts and their mechanical and physical function along with the external view of the physiological unit are clearly presented. The article also includes three diagrams illustrating the construction of the physiological unit, the unit for artificial circulation, and the unit for measuring blood pressure.

64. Chinese Study Hemostatic Disturbances in Experimental Leptospirosis

"Changes in Blood Coagulation in Experimental Leptospirosis of Laboratory Animals," by Ts'ao Wei-chi (曹維驥), Chung Hui-lan (鍾惠瀾), Hou Tsung-ch'ang (侯宗昌), and Olega Geszti, Department of Internal Medicine, Peking People's Hospital; Peiping, Chung-hua I-hsueh Tsa-chih (National Medical Journal of China), Vol 44, No 3, Mar 58, pp 234-239

This article presents the details of animal experiments undertaken in a study of blood coagulation in guinea pigs experimentally infected with Leptospira icterohemorrhagiae, and particularly the changes in prothrombin activity and the effect of vitamin K administration. The purpose of the study was to determine, if possible, whether liver damage or clogging of the bile ducts in the liver is the primary cause of jaundice in Weil's disease. The authors say there is no satisfactory explanation of the phenomenon in the literature. Nor has anyone previously conducted a full investigation of the blood clotting mechanism in leptospirosis.

Eighty-six guinea pigs, averaging 180 grams, were used in the experiments. All except the controls were each infected with 0.5 milliliter of a 5-day culture of L. icterohemorrhagiae. Blood specimens were obtained on the third and fifth days and tests were run to determine changes in bleeding time, coagulation time, direct platelet count, calcium time, one-state prothrombin time, amount of plasma heparin which could be neutralized by toluidin blue, Factor V activity, Factor VII activity, and fibrinogen B. The effect of vitamin K administration on the hemostatic measurements of infected animals was observed. The results of the tests are charted and discussed.

It was found that in experimental leptospiral jaundice, bleeding time, calcium time, and one-stage prothrombin time were prolonged; Factor V activity, slightly reduced; and plasma heparin which could be neutralized by toluidin blue, reduced by approximately 60 percent. These abnormalities were corrected with a 3-milligram dose of vitamin K. Leptospirosis caused no marked changes in clotting time, platelet count, or Factor VII activity; but 80 percent of infected animals demonstrated a negative fibrinogen B test, as compared with 90 percent positives among normal guinea pigs.

In discussing the significance of their experimental results, the authors made the following observations:

Leptospiral jaundice appears to belong in the category of diseases which retard the functions of reticuloendothelial cells rather than in the category of diseases which enhance those functions. Besides partial reduction in reticuloendothelial cell activity, clogging of the liver bile ducts resulting in disturbances in vitamin K absorption occurs at least in the experimental form of the disease. Jaundice seems to take place as the result of liver damage and clogging of the bile ducts in that order. Vitamin K therapy is essential.

Coagulation measurements for normal guinea pig blood were determined and are discussed in comparison with values for normal human blood.

65. New Czechoslovak Preparation of Species-Nonspecific Plasma for Transfusion Exerts Favorable Therapeutic Effects

"Czechoslovak Preparation of Species-Nonspecific Plasma for Transfusion," Casop. Lek. Cesk., 1957, 20, 614-617, (Czech) (from Meditsinskiy Referativnyy Zhurnal, No 10, Section 2, Oct 57, p 17)

"Results of the effect of certain species-nonspecific plasma preparations and a new Czechoslovak preparation are compared. The latter has the necessary therapeutic properties. Preliminary research indicates that the preparation is metabolized by the organism. The preparation contains the following: 4.5% proteins, 120 mg % additional nitrogen [nonprotein nitrogen], and 0.9% sodium chloride. Its oncotic pressure is 150 mm of water, its pH is 7.5, and the stable pH is at 3.5 to 4.5. The preparation is prepared by a new method which eliminates the unfavorable effects of foreign proteins."

Hygiene and Sanitation

66. Dilution of Contaminated Air Pumped From Atomic Electric Power Stations Recommended

"Problems of Contamination of Atmospheric Air by Radioactive Substances," Ceskoslov Hyg., 1957, 11, 2/3, 115-122 (Czech) (from Meditsinskiy Referativnyy Zhurnal, No 8, Aug 57, pp 42-43)

Under normal conditions, the concentration of radioactive aerosols in the atmospheric air is very insignificant, while higher concentrations are observed due to work with radioactive substances, work with reactors, and work with the development of nuclear fuel, and also as a result of nuclear tests.

Radioactive aerosols in the air may be determined by using instruments which entrap the aerosols on filters or on electrostatic precipitating agents. The activity of the precipitate is then determined by the Geiger-Muller counter or by a scintillating indicator. Radioactive gas content of air is usually determined by ionizing chambers.

Aerosol entrance into the atmosphere may be decreased by rationalization of industrial processes, i.e., by filtering the contaminated air which is pumped from industrial installations and diluting it with fresh air.

Since the number of nuclear reactors will increase, it is necessary to consider the possibility of increased radioactive contamination of atmospheric air. Therefore, it is necessary to select sites for the construction of atomic electric stations and to develop less harmful types of reactors and safer and more hygienic methods of releasing nuclear energy.

67. Effects of High-Frequency Electromagnetic Fields on Industrial Workers Studied

"Some Problems of Industrial Hygiene in Work With High-Frequency Currents," by G. L. Khazan, N. N. Goncharova, and V. S. Petrovskiy, Khar'kov; Ukrainian Institute of Industrial Hygiene and Occupational Diseases; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 1, Jan/Feb 58, pp 9-16

A model of an instrument was developed which made possible the direct measurement of the magnetic component of an electromagnetic field and the computation of the electrical component. Tests were then carried out on industrial workers exposed to the effects of electromagnetic fields of high- and ultra-high frequency acting on the functional state of the vegetative and central nervous system. Changes were observed during working hours in the temperature of the body and skin, pulse, vascular reactions, and conditioned-reflex reactions.

Generator shields were developed for reduction of field strength in working areas.

68. Significance of Plague Toxin in Active Immunization

"The Action of Glycocoll on B. pestis; Report III, The Nature of Plague Toxin and Its Significance in Active Immunization," by Ye. I. Korobkova, State Scientific Research Institute 'Mikrob'; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 11, Nov 57, pp 143-148

This article concerns efforts of Soviet investigators to improve vaccine therapy of plague. The author acclaims successful results in this field achieved within the last 5 years, among which are the introduction into practice of an effective live bivalent vaccine (1-17), development of new methods of inoculation, and the discovery that intracutaneous and cutaneous methods are more effective than subcutaneous. The purpose of the research described here was to isolate plague toxin and to arrive at a better explanation of the possibilities of using toxic products of B. pestis for active immunization against plague.

The following basic methods were employed to isolate plague toxin: lysis of microbial cells, drying and subsequent extraction, chemical treatment, and extraction of membrane antigen. E. V. Zhirar and Robik strains of B. pestis were used to isolate active toxin.

This report presents evidence that two types of toxins can be obtained from B. pestis; one is a metabolic product of the living organism, the other is liberated after lysis of the pathogen. Some results presented in previous reports are summarized as background. The following five tables, discussed in the text, are presented to show results of the experiments: neutralization of toxins with sera obtained by immunization with various antigens; immunogenic properties of toxin I for white mice; results of two-time immunication of mice with formalinized toxin; immunization of white mice with dry live vaccine 1-17 of different preparation (series No 55/I, series No 14 plus inactivated toxin); and results of immunizing white mice with dry live vaccine 1-17 depending on its content of inactivated toxin. Dosages are given in the article.

The author presents several conclusions based on the results of the experiments:

"1. B. pestis cultured on Hottinger's agar with glycocoll yields products which are highly toxic for white mice and rabbits. B. pestis cultured on ordinary agar treated with a glycocoll solution is lysed and releases toxic substances. Both toxins differ in their lethal and antigenic properties and in mechanisms of their formation; the first, on the

whole, is soluble and is given off by B. pestis in metabolic processes during which glycocoll is used by the pathogen for synthesis of toxic products; the second is produced from the cell following lysis.

"2. The immunological significance of the toxins obtained is demonstrated in the neutralization reaction. Both toxins possess antigenic characteristics and cause antitoxins to be formed in immunized animals. Sera obtained by immunization of horses with repeated injections of live EV bacillus contained antitoxin to strong toxin I and to a lesser extent to lysate-toxin. Sera from rabbits immunized with killed EV strain bacteria neutralized lysate-toxin but had no effect on toxin produced by bacteria cultured on agar with glycocoll.

"3. Mice immunized repeatedly with sublethal doses of natural toxin withstood infection with virulent plague bacteria and toxin. Formalinized toxin (anatoxin) also gave mice a resistance to natural toxin and virulent bacteria. Antitoxins were observed in mouse serum. Thus, immunity, antitoxic according to mechanism, was found to be antibacterial according to results.

"4. Pigs and mice have similar sensitivity to B. pestis, but differ sharply in their immunological reactivity; mice are more sensitive to toxic products of B. pestis than pigs.

"5. Live antiplague vaccine to which harmless toxin had been added in low concentration was found to be considerably more effective than ordinary vaccine and reproduced antibacterial and antitoxic immunity.

"6. These investigations herald prospects for additional increase in the effectiveness of live vaccines combined with harmless toxin. Such a combined vaccine produces a defensive reaction which arises after the development of natural immunity. The immunogenicity of a live vaccine should be studied in white mice as well as in guinea pigs."

69. Mass Production of Polio Vaccine To Start Soon

"For Monkeys to China," by jb. [not further identified]; Warsaw, Trybuna Ludu, 24 May 58, p 6

In 1957, a special division was organized at the Sera and Vaccines Plant (Wytwornia Surowic i Szczepionek), Lublin, for the production of Heine-Medin, called "Polio," vaccine.

Thus far, only the US, France, and Great Britain have been producing Heine-Medin vaccine on an industrial scale. As soon as a supply of monkeys is received, the above-mentioned plant will start mass production of the vaccine. A group of workers, headed by Dr Docent W. Mirkowski, from the Sera and Vaccines Plant, Lublin, left by a special plane to China for a supply of monkeys. The 300 monkeys that will be brought back will be kept on a "monkey farm" in one of the centers (near Lublin) of the Sera and Vaccines Plant.

70. Visceral Peritoneum of the Caecum Proved Best for Peritoneal Preparations; Their Extensive Use Recommended for Medical Purposes

"At the Scientific Council of the Ministry of Health USSR, Peritoneal Preparations and Their Use," unsigned article; Moscow, Meditsinskiy Rabotnik, No 8, 28 Jan 58, p 4

Among the speakers at a meeting of the presidium of the Chair of Histology of the Kishinev Medical Institute, Docent N. N. Kuznetsov, a prominent member who for many years has devoted his studies to research on absorbable plastic biological material, reported on the subject of "Peritoneal Preparations and Their Use."

His research on the morphology and physicomechanical properties of visceral peritoneum of the gastrointestinal tract of cattle indicates that the best peritoneal preparations (considering strength and elasticity) for surgical purposes is the visceral peritoneum obtained from the caecum.

Preparations displayed and/or described at this meeting included suturing material of varying thicknesses, string, plastic material resembling thin glossy paper, small tubes of varying caliber with walls of different thickness and density, rings for repairing blood vessels, and pins for osteosynthesis. Tests indicate that these preparations can well withstand sterilization procedures and are absorbed by different tissues at various rates depending on their preparation and usage.

The new preparations have been used on various organs, for example, the gastrointestinal tract, trachea, blood vessels, peripheral nerves, and dura mater. A number of clinics reports that the plastic material, tubes, and pins are temporary biological prostheses which create favorable conditions for regenerative processes and speed tissue reparation.

Prof I. V. Davydovskiy, who presided at this meeting, gave his approval of the research by N. N. Kuznetsov. A resolution was adopted to allow a month for the technology of the production of the peritoneal preparations and to recommend them for introduction into extensive medical practice.

71. Addition of Ascorbic Acid to Therapeutoprophylactic Diets Recommended to Increase Protective Powers of People Against Toxic Substances

"Therapeutoprophylactic Nutrition," by Prof M. Marshak and A. Grubina, Candidate of Medical Sciences; Moscow, Meditsinskiy Rabotnik, No 27, 4 Apr 58, p 2

Nutrition has an influence on various functional conditions of an organism, and the effect of toxic substances depends on the general condition and the reactivity of an organism which influences its ability to ward off or eliminate poisons.

The general characteristics of a few rations are mentioned, for example, that for workers coming in contact with aniline dyes and with inorganic compounds of lead. The addition of ascorbic acid is recommended to stimulate oxidative processes and to increase the antitoxic and protective powers of an organism.

72. Gramicidin-Ascorbic Acid Tablets Proved Effective in Preventing Scarlatina Are Subjected to Extensive Tests

"Gramicidin-Ascorbic Acid Tablets" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 22, 18 Mar 58, p 4

Tablets containing gramicidin and ascorbic acid have been suggested by a group of workers of the Sverdlovsk Scientific Research Institute of Antibiotics, under the leadership of Prof L. G. Perets. It has been established that the effect of gramicidin on streptococci, on staphylococci, and on other microorganisms is increased by the addition of ascorbic acid and tannin to them. The tablets are used sublingually, and consist of the following: 1,000 gamma gramicidin, 0.07 g ascorbic acid, 0.002 g tannin, and one gram of sugar and filler. The tablets have been used by this institute to prevent scarlatina, and as a result of observations on 2,000 children, susceptibility to this disease was reduced to one third the previous level.

Judging from these results, the Committee on Antibiotics under the Ministry of Health USSR has decided to subject this new prophylactic agent to extensive testing.

73. Industrial Production of Valuable Organic Preparations From Protein Fraction of Bone Marrow Urged

"Use of Protein Fraction of Bone Marrow for the Production of Organic Preparations," by S. M. Shcheglov; Moscow, Izobretatel'stvo Na Sluzhbe Narodnogo Khozyaystva, No 1, Jan 58, pp 6-9

Among the decisions of the 20th Congress of the Communist Party of the Soviet Union concerning the Sixth Five-Year Plan, attention was focused on the discovery and the extensive production of new and more effective therapeutoprophylactic means, for example, the use of bone marrow from all types of animals used in the meat industry. Since bone marrow is important in the therapy of hemopoietic diseases and anemias of various etiology and it is effective in counteracting the effects of ionizing radiation, it is necessary to introduce certain technological modifications in the processing of bone, so that from its protein fraction -- a valuable source of raw material -- the production of therapeutic organic preparations becomes possible.

The article describes certain details for extracting and preserving bone marrow, and especially red bone marrow. Bone marrow extract is prepared in the form of infusion with glycine, as aqueous extract, mixed with milk, powder form, etc. The protein fraction of bone marrow is flocculent and light brown and is called preparation "SEP." Preparation "SEP," depending on its source (i.e., bones of young or fully grown cattle), differs in its content of moisture, ashes, and fat. Three types or series of preparation "SEP" are presented. An analysis of the amino acid, trace elements, and vitamin content of the protein fraction of bone marrow is presented.

Studies of the biological activity and toxic properties of preparation "SEP" were conducted on 180 albino mice, most of which were subjected to X-ray irradiation by 350 r.

Results indicate that preparation "SEP" series with minimum fat content (1.5-3.5%) possesses therapeutic properties, changes the sensitivity of mice to roentgen rays, decreases their mortality, and prolongs their life span. Increased fat content (17.9%) of preparation "SEP" has negative biological effects.

The author makes the following conclusions:

1. The best variant of preparation "SEP" is the preparation (in powder form) with the following composition: moisture, not more than 8%; ashes, not more than 10%; fat, not more than 5%; folic acid, not less than 9 mg g [most likely %]; and nicotinic acid, not less than 590 mg %.

2. The protein fraction of bone marrow has therapeutic properties in accordance with its content of active elements and biological activity, and may be used as a valuable source of raw material for the production of organic preparations.

3. To use the proteins of bone marrow as a source of raw material, it is necessary to introduce into cattle meat-combines separate technological bone processing.

Physiology

74. Administration of Vitamin P Increases Endurance of Animals in Rarefied Atmosphere

"Effect of Vitamin P Preparation From Rosa canina on the Endurance of Animals in Rarefied Atmosphere," by Ye. F. Shamray, N. S. Verkhratskiy, U. A. Kuz'minskaya, and V. A. Nikonova, Chair of Biochemistry of the Kiev Medical Institute; Moscow, Voprosy Meditsinskoy Khimii, Vol 4, No 2, Mar/Apr 58, pp 120-123

"Results of experiments conducted on white rats and mice showed that administration of vitamin P preparation, obtained from Rosa canina, increased tolerance of those animals to conditions of decreased atmospheric pressure. Vitamin P preparation had no effect on the respiration of animal tissues. This indicates that survival of animals in rarefied atmosphere is not connected with utilization of oxygen by tissues, but evidently depends on the roborant effect of vitamin P preparation on the capillaries. Experiments on guinea pigs produced substantially the same results."

75. Adaptation to Hypoxia Regained in Animals With Injured Cerebellum

"Reaction to Hypoxia of Animals With Injured Cerebellum," by Z. I. Barbashova, Izv. Yesestv. Nauchn. In-ta im. P. F. Lesgafta (News of the Natural-Sciences Institute imeni P. F. Lesgaft), 1957, 28, 159-168 (from Referativnyy Zhurnal -- Biologiya, No 4, 25 Feb 58, Abstract No 18547, p 464)

"The cerebellum of rats was either severed or injured. This decreased the endurance of rats to acute hypoxia. However, following prolonged acclimatization, compensatory shifts appeared in these rats with respect to the frequency of respiration and increased erythrocyte content of blood. Thus, by prolonged training, injury of cerebellum does not eliminate animal adaptation to hypoxia."

76. Radioactive Bromine Studies Indicate Changes in Spinal Reflexes Not Connected With Changes in Neuromuscular Apparatus

"Chronaxie of Neuromuscular System and Defense Reflexes in Dogs Under the Effect of Radioactive Bromine," by A. I. Ul'yanova and V. P. Shmelev, Chair of Normal Physiology (head, Prof A. P. Zhukov), Voronezh Medical Institute; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 19-22

The aim of this research was to study the neuromuscular system and spinal reflexes under the effect of radioactive bromine ($NaBr^{82}$). Tests were conducted on dogs which were administered 0.170 to 0.342 millicuries per os, two to four times, with an interval of 12 days to 6 months.

Results show no changes in the behavior of the experimental animals, but the chronaxie of unconditioned defense reflexes were prolonged by 135-320% of its original value. Radioactive bromine first shortened muscle chronaxie by 1.5-2.5, but at a later period this chronaxie became prolonged. No changes were evident in the rheobase of muscle chronaxie or in the chronaxie of defense reflexes after the introduction of $NaBr^{82}$. Changes in the neuromuscular system appeared and disappeared on the first day, while changes in spinal reflexes were retained up to the 5th day. Therefore, one may conclude that changes of spinal reflexes are not connected with those of the neuromuscular system.

Changes of chronaxie of flexor reflexes and changes of chronaxie of femoral flexors participating in defense reflexes have the same characteristic, i.e., prolongation of chronaxie, but the origin and the duration of these changes are different. Changes in the peripheral neuromuscular apparatus arise sooner and are of a shorter duration than changes in the reflex apparatus. Therefore, changes in the reflex arc cannot be explained by changes in the neuromuscular apparatus.

Public Health, Hygiene and Sanitation

77. Long-Range Public Health Plan for Kazakh SSR

"Long-Range Draft Plan for Development of Health Service in the Republic," by V. N. Lobova, Chief of Planning and Finance Administration, Ministry of Health Kazakh SSR, Zdravookhraneniye Kazakhstana, No 3, Mar 58, pp 3-11

The following is a summary of the source article:

Successful fulfillment of the Seven-Year Plan (1959-1965) of the health service in the Kazakh SSR depends principally on availability of a greater number of new standard-type buildings to house hospitals, creches, sanatoriums, sanitary-epidemiological stations, dairy kitchens, and pharmacies. By the end of 1956, new standard-type buildings must be constructed in the republic that will be able to accommodate therapeutic and preventive medical establishments with a bed capacity of 45,000; new standard-type buildings for creches must have space for 55,000 children; new standard-type buildings to be used as sanatoriums must have room enough to accommodate 7,500 people at one time. The sanitary-epidemiological stations on the oblast level must have 15 new standard-type buildings; the dairy kitchens need 20 such structures, and pharmacies and medical schools and medical schools on the subprofessional level need additional buildings that will meet the minimum standards prescribed by the government.

The buildings to house hospitals and creches in various sovkhozes must be construced by the latter and paid for out of the funds made available by the Ministry of Agriculture. Construction of buildings to house medical establishments in kolkhozes must be paid out of the funds earmarked for capital improvements of those kolkhozes. The Ministry of Health Kazakh SSR will make funds available for the construction only of those therapeutic and preventive establishments and medical schools of republic subordination and those that are located in cities and rayons which are not well developed industrially.

The Kazakh SSR will need 24,800 professional level medical personnel by the end of 1965. This is an increase of 13% over the number of professional medical personnel expected to be practicing in the republic by the end of 1958, or an increase of 13,800. Since the four medical institutes currently operating in Kazakhstan cannot possibly graduate any more than 11,800 people in the 7 years ending in 1965, a fifth medical institute must be commissioned and the facilities of the other four must be expanded. The number of people of subprofessional level must rise to 69,500; this is an increase of 115% over the number expected to be on hand by the end of 1958. Taking into consideration all projected figures, it is expected that by the end of 1956 there will be 21.6 physicians for every 10,000 people.

The decision of the Central Committee of the Communist Party of the Soviet Union and of the Council of Ministers USSR to promote the Seven-Year Plan was based on realization of superiority of the socialist economic system and on recognition of remarkable potentialities of the Soviet Union. This plan is expected to pave the way for a more vigorous growth of the national economy which is already catching up fast to the most advanced countries in the world.

Rapid expansion of large-scale agriculture in Kazakhstan made that republic the second largest granary in the USSR. The Kazakh SSR has been able to contribute greatly toward the efforts of the USSR to catch up to the US in output of meat, milk, and butter. This was achieved with the aid of the Russian and other peoples of the USSR. The rate of industrial growth of the Kazakh SSR has also been great, and during the period 1959-1965, the republic may outstrip the rest of the country in industrial expansion, especially since the republic is rich in mineral and other natural resources. Industrialization has been particularly rapid in the following oblasts: Kustanayskaya, Karagandskaya, Pavlodarskaya, and Vostochno-Kazakhstanskaya.

The outlook for expansion of health service in Kazakhstan is, therefore, very favorable. The steady rise in the material well-being and cultural level of the population, healthy working conditions and shorter working hours, improved housing and proper sanitary conditions in populated places, and increase in the number of public eating places are creating conditions for a continued drop in the morbidity and mortality rate, improvement in general health of the population, and increase in average life expectancy.

The network of health establishments in Kazakhstan has expanded considerably during the past 5 years. There was a 50% increase in the number of hospital beds under the jurisdiction of the Ministry of Health of the republic. The increase in hospital beds in rural areas was 67%, spaces in permanent creches increased by 33%, the number of beds in sanatoriums increased by 24%, and the number of physicians increased by 51%. The increase in the network of health establishments, however, has not kept pace with the rate of economic growth of the republic.

As of 1 January 1958, accommodations in hospitals were available for only 72% of people who needed hospital care; space was available to hospitalize only 26.7% of those with nervous diseases, and only 7.5% with diseases of the urinary tract. Hospital care embraced only 24.5% of otolaryngological cases. Only 64% of people in rural areas that needed hospitalization were accommodated. Hospital service to the rural population has been particularly poor in Kzyl-Ordinskaya Oblast, Gur'yevskaya Oblast, Zapadno-Kazakhstanskaya Oblast, and Yuzhno-Kazakhstanskaya Oblast.

There are 161 rayon hospitals in rural areas of Kazakhstan with an average bed capacity of 49, although each rayon hospital must have 75 beds available. There are still 72 rayon hospitals in the republic with a capacity of only 35 beds. There are 869 medical district hospitals in Kazakhstan with an average bed capacity of only 12 beds. It can be seen, therefore, that a need exists for expansion of qualified hospital care.

The Ministry of Health Kazakh SSR, with the aid of its various directorates, departments, branches of health service, and workers of scientific-research and medical institutes, is laying foundation for a draft plan for expansion of health service during 1959-1965.

On the basis of preliminary estimates, 1.9 billion rubles will be spent on construction of hospitals, outpatient clinics, resorts, and creches. About 1.3 billion of that money will be allocated for construction of preventive medical establishments; 168 million, for construction of sanatoriums and rest homes; and 200 million, for construction of buildings to house creches.

The draft plan must provide a solution for the following problems confronted by the public health establishments: therapeutic and preventive aid, obstetrical and gynecological service, therapeutic and preventive medical service to children, sanatoriums and resort service, and sanitary-epidemiological service. I must be recognized that the incidence of cardiovascular diseases (endocarditis, hypertonia, rheumatism), diseases of the skin, malignant neoplasms, industrial traumatism, and catarrhal diseases has been very great in Kazakhstan.

By the end of 1965, hospital capacity in urban areas of the Kazakh SSR (that are under the jurisdiction of the Ministry of Health) will reach 64,000 beds. This will be a 58% increase, or an increase of 25,000 beds. In rural areas the number of hospital beds available will be 38,000 or an increase of 14,000.

Bed capacity in psychoneurotic establishments and in psychoneurotic wards of general hospitals will reach 7,600 by the end of 1965, which is an increase of 181%. To hospitalize patients with chronic diseases and who need specialized hospital care, 6,450 beds must be made available.

On the basis of this increase in bed capacity it will be possible to have, by 1965, 13 beds available per 1,000 persons in urban areas and 5.5 beds available per 1,000 persons in rural areas. There will be 0.91 bed per 1,000 persons for psychoneurotic patients and 0.5 bed per 1,000 persons for those afflicted with chronic ailments. The number of days that hospital beds will remain in use during a year in urban areas must be raised to 330 days (against 294 in 1956); in rural areas, to 300 days (against 264 in 1956). If the average number of days a patient will remain in a hospital in urban areas will be 15 days (against 14 in 1956),

the turnover of patients per year will be 22; in rural areas the average will be 12 days and the turnover will be 23. Calculations are based on Ministry of Health USSR Order No 217 of 29 October 1954 and titled "Standard for Hospital Treatment." The ratios were calculated on the basis of analysis of morbidity rate in the Kazakh SSR, based on reported data for 1956.

Measures against tuberculosis must have a special place in the Seven-Year Plan. Incidence of tuberculosis and mortality due to tuberculosis dropped considerably in the past few years. If beds are occupied 330 days each year, then on the basis of that there must be 10,000 beds for tuberculosis patients in urban areas by the end of 1965 against 4,750 by the end of 1958. This is an increase of 110%. In other words, there will be two tuberculosis beds available for every 1,000 people in urban areas and 1.5 tuberculosis beds available for every 1,000 people in rural areas. The total number of tuberculosis beds in rural areas must be increased to 8,000 by the end of 1965 (against 2,510 in 1958), which is an increase of 213%. To intensity the fight against tuberculosis hospitalization must embrance 57% of those infected and the average length of their stay in a hospital must be raised to 85 days.

Work against tuberculosis is lagging in the following oblasts of Kazakhstan: Pavlodarskaya, Kokchetavskaya, Kustanayskaya, Kzyl-Ordinskaya, Zapadno-Kazakhstanskaya, and Gur'yevskaya.

Besides expansion of hospital facilities, there must be mass preventive examinations and immunization of the population against tuberculosis. All tuberculosis establishments must be reinforced with specialists trained in modern methods of treatment and prevention of tuberculosis.

Trachoma must be eradicated in Kazakhstan and specialized treatment of eye diseases must be extended to the rural areas.

By the end of 1965 all rayon hospitals must have eye clinics manned by ophthalmologists. Approximately 2,360 hospital beds in the republic must be reserved for eye patients. Of this number, approximately 1,560 must be allocated to urban areas, against 547 in 1956 or 0.3 bed per 1,000 people. In rural areas, there must be approximately 800 beds, or 0.15 bed per 1,000 people.

A network of feldsher posts must be established in Yuzhno-Kazakhstanskaya, Vostochno-Kazakhstanskaya, Taldy-Kurganskaya, Pavlodarskaya, Kustanayskaya, Dzhambulskaya, and Kokchetavskaya oblasts and in all populated places where trachoma has been noted with the aim of eradicating that disease entirely.

Fungus infection and active forms of syphilis must be eradicated during 1959-1965. The incidence of gonorrhea and parasitic cutaneous diseases must be drastically reduced. It is necessary to expedite training of physicians specializing in dermatology and venereal diseases and to expand specialized medical aid in those fields.

It is necessary to raise the skin disease outpatient clinics and venereal outpatient clinics of oblast level of first category and increase their bed capacity to 100. Venereal disease clinics must be organized in all rayon centers which have a venereologist on duty and its wards for infectious diseases must have five to ten beds reserved for hospitalization of venereal patients.

The over-all plan of medical service to the population of Kazakhstan must give special attention to medical aid to those workers employed in the most essential branches of industry. All therapeutic and preventive establishments must participate in that work. A network of special establishments as the emergency medical aid units and health posts must be expanded.

In accordance with the regulations, approved by the Ministry of Health USSR, the following industrial establishments rate an emergency medical aid unit: ferrous metallurgy with at least 3,000 employees; machine construction industry with at least 4,000 employees; coal mining, oil extracting, and nonferrous metallurgy with at least 1,500 employees; chemical and oil processing industry with at least 1,000 employees; and other industrial establishments with more than 5,000 employees. Feldsher posts and professional medical posts must also be organized in accordance with established regulations, depending on the type of industry and the number of people employed in each plant.

Outpatient medical aid is very important in the general framework of therapeutic-preventive service. Four to five times more people need outpatient treatment than need hospitalization.

The Seven-Year Plan (1959-1965) must have provisions for improving the outpatient service. Plans for expansion of outpatient clinics must assume that in urban areas each person will pay nine visits to the outpatient clinc per year, of which three visits will be preventive visits; in rural areas each person will pay six visits to the outpatient clinic.

The medical district principle must be strictly adhered to in all cities. A city medical district embraces an area with a population of net more than 4,000 people and is entitled to at least 6.5 professional medical personnel. The medical district in cities is also entitled to two nurses for each physician and pediatrist. Transportation must be available for physicians and nurses. One light motor vehicle is to be shared by two city medical districts.

The feldsher and midwife posts are still important in Kazakhstan, because the republic is not very densely populated. The ideal situation in rural areas is as follows: one person of subprofessional level on duty to serve between 300 and 500 people and one feldsher and one midwife on duty to serve between 500 and 800 people.

On the basis of the possible birth rate by the end of 1965, there must be 1.2 maternity beds available for every 1,000 people in urban areas and one bed available per 1,000 people in rural areas. This takes itno consideration that in rural areas, 80% of pregnant women will be hospitalized in maternity hospitals or in maternity wards.

By the end of 1965, 6,000 additional maternity beds will be needed in urban areas; this is an increase of 30% over the number that will be available by the end of 1958. In rural areas 7,880 maternity beds must be added, for an increase of 94% over the number that will be available by the end of 1958.

The level of gynecological service in the Kazakh SSR is very low. In 1956 there were 1,700 beds in urban areas for gynecological patients, which is 0.5 beds per 1,000 people; in rural areas there were 2,000 beds for gynecological patients, or 0.04 beds per 1,000 people. A situation like that will allow hospitalization of only acute forms of gynecological disorders.

By the end of 1965, it is necessary to have in urban areas 5,000 gynecological beds available, or one gynecological bed per each 1,000 people; in rural areas, ther must be 2,360 gynecological beds available, or 0.3 beds per 1,000 people.

Shortage of beds existed in urban areas in children's hospitals and in children's wards in hospitals during 1956. Hospital facilities for children in urban areas were only 82.7% adequate and in rural areas only 29% adequate. Children who had diphtheria were the only ones who received proper hospital care. Hospitalization of whooping cough and measles cases was not adequate. For example, only 3.2% of children with measles were hospitalized in Aktyubinskaya Oblast; only 3.7% in Dzhambulskaya Oblast; and only 8.7% in Yuzhno-Kazakhstanskaya Oblast.

The main task before Kazakh SSR medical establishments is to increase the quality of health protection to infants and children. Infant mortality must be reduced during 1959-1965.

By 1960 there should be one physician for up to 1,000 children and 1.5 nurses for each physician in each medical district. By 1965 there should be one physician for 900 children and two nurses for each physician in each medical district.

Increase in hospital beds for children must be accomplished by merging children's wards in medical district hospitals with outpatient and consultation clinics of children's hospitals in cities and rayon centers. Consultation units for children must be organized in large district hospitals and particularly in sovkhozes.

Control of hypotrophy and rickets depends on proper feeding of infants up to the age of one year. Dairy kitchens must be established in all cities and in all rayon centers. New standard-type buildings must be constructed to house dairy kitchens in oblast centers and three such buildings must be constructed in each of the following cities: Alma-Ata, Karaganda, and Ust'-Kamenogorsk.

Expansion of creches must be given special attention. In urban areas, during 1956, 6.8% of children were accommodated, and in rural areas, 3.3% of children were accommodated in creches. By 1965 there must be at least 56,000 spaces available in creches in urban areas (under the jurisdiction of all departments), or an increase of 126% over the number existing in 1956; in rural areas, 50,000 spaces, or an increase of 140%. By the end of 1965, there must be enough space available to accommodate up to 14% of children of creche age in cities and up to 8% of children of creche age in rural areas.

In any plan to increase the number of spaces in creches, the primary consideration must be given to the number of employed women. It has been computed that eight spaces in creches must be available for each 100 employed women.

Decree No 1414 of the Council of Ministers USSR, dated October 13 1956 and titled "Concerning Further Measures of Aiding Mothers Employed in Industries and Service Organizations," states that creches and kindergartens and other establishments for children of preschool age must be available for the convenience of employed mothers. Operation of the above-mentioned establishments for children must be paid for not from funds earmarked for health service, but out of available funds of sovnarkhozes (councils of national economy) or corresponding industrial or service establishments.

There are valuable resort sites and mineral springs in the Kazakh SSR. However, the network of resorts is developing very slowly in the republic. There must be 7,850 beds available in sanatoriums and 2,450 beds in rest homes in the republic by the end of 1958. There are 7.5 beds in sanatoriums and 2.4 beds in rest homes per 1,000 people. In the sanatoriums for children, there are 3,300 beds available, or 0.9 bed per 1,000 children up to 14 years of age. By the end of 1965, there must be 14,000 beds in sanatoriums and 10,000 beds in rest homes.

There are 274 sanitary-epidemiological stations in Kazakhstan, this includes the sanitary-epidemiological sections of the rayon hospitals. Many sanitary-epidemiological stations are housed in buildings which do not meet the minimum requirements and, because of lack of space, 65 of the stations have no bacteriological laboratories.

Shortage of health officers has created a situation whereby there are 70,000 people instead of 40,000 for each health officer who is assigned to supervise housing and communal sanitation and food hygiene. The number of health officers to supervise housing, communal, school, and food hygiene and sanitation must be doubled by 1965 if sanitation work is to be carried on properly. New types of buildings must be constructed in oblast centers and in large industrial cities to house sanitary-epidemiological stations; in rayon centers new types of buildings must be constructed to accommodate bacteriological laboratories. All stations must be provided with automotive transport and other necessary equipment so that they can expedite disinfection work in the territories assigned to them.

78. Hygienic Requirements During Use of Organophosphorus Insecticides

"Industrial Hygiene During the Systematic Use of Organophosphorus Insecticides," by Yu. S. Kagan, Yu. I. Kundiyev, and M. A. Trotsenko, Kiev Institute of Industrial Hygiene and Professional Diseases; Moscow, Gigiyena i Sanitariya, No 6, June 58, pp 25-31

After studying the hygienic conditions of labor while dusting fruit trees with mercaptophos and finding reduced blood serum cholinesterase activity in some of the workers, the authors conclude that it is necessary to use tractor-sprayer systems which do not require a hose operator. In addition, sprayers should be mounted on tractors equiped with hermetically sealed cabins and workers should be supplied with F-6 respirators fitted with type A gas filters, overalls, goggles, aprons, and rubber boots.

Radiology

79. Immediate Fall Then Sharp Rise of Specific Activity of Phospholipid Phosphorus Is Noted After X-Ray Irradiation

"Change of Composition and Metabolic Processes of Bone Marrow Following the Effects of Ionizing Radiation," Tr. Vses. Konferentsii Po Med. Radiol.. Eksperim. Radiol. (Works of the All-Union Conference on Medical Radiology. Experimental Radiology), Moscow, Medgiz, 1957, 130-135 (from Referativnyy Zhurnal - Khimiya Biologicheskaya Khimiya, No 4, 25 Feb 58, Abstract No 4949)

"Irradiation of rabbits by X rays in various doses decreases nucleic acids level per gram of bone marrow as early as 4 hours after irradiation, and the P^{32} level in nucleic acid is significantly decreased also. The specific activity of the phosphorus of DNA and RNA during the first hours after irradiation effects decreases to the same degree, but the restoration of RNA synthesis starts before that of DNA.

"Starting with the third day after irradiation, the specific activity of the phosphorus of the nucleic acids is significantly higher in the experimental animals than in the controls. The synthesis of phospholipids decreases during the first few days after irradiation, but on the 12th to the 14th day a sharp rise is noted in the specific activity of the phosphorus of the phospholipids."

80. Study of Radiation Hygiene Introduced Into Curriculum of First Moscow Medical Institute

"The Study of Radiation Hygiene Is Introduced" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 29, 11 Apr 58, p 4

This year, the study of radiation hygiene has been introduced into the curriculum of the first Moscow Medical Institute. The students become acquainted with the methods of research in the field of ionizing radiation applicable to air and water environment, and to equipment and conditions for working with radioactive substances in industry and at medical institutes. The radiological laboratory at the Chair of General Hygiene has been equipped for this purpose.

Regular reports prepared at this institute on the practical aspects of work connected with radiation hygiene are being used at other medical institutes of the Soviet Union.

81. Book Published on Various Phases of Acute and Chronic Radiation Sickness

"Trudy Vsesoyuznoy Konferentsii Po Meditsinskoy Radiologii. Klinika i Terapiya Luchevoy Bolezni" (Works of the All-Union Conference on Medical Radiology. Clinical Management and Therapy of Radiation Sickness), Edited by A. V. Kozlova, Medgiz, 1957, 322 pages (from Meditsinskiy Rabotnik, No 25, 28 Mar 58, p 4)

"This book is a collection of reports on the clinical management of acute and chronic radiation sickness, its prophylaxis, therapy, and combined injuries and sequelae of radiation sickness. A number of reports explain the use of radioactive substances in therapy and in diagnosis."

82. Ionizing Radiation Increases Rate of Absorption of Dysentery Endotoxins From Intestinal Walls Into Blood Causing Bacteremia

"Concerning the Absorption of Endotoxins of Dysentery Bacteria During Radiation Sickness of Rabbits," by M. A. Tumanyan and F. M. Sosnovskaya, Division of Medical Microbiology (head, V. L. Troitskiy, Corresponding Member of Academy of Medical Sciences USSR), Institute of Epidemiology and Microbiology imeni N. F. Gamaleya of Academy of Medical Sciences USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 46-49

Data indicate that various processes of absorption from the intestinal wall are changed during radiation sickness. In addition, it is known that under the effect of ionizing radiation, various protective barriers, including the intestinal wall barriers, of an organism are changed. This is one of the causes of producing the very dangerous bacteremia.

The purpose of this research was to study the effect of ionizing radiation on the absorption of dysentery antigens from the intestinal wall. Tagged polysaccharide-protein complexes of dysentery bacteria were administered, per os, to rabbits.

Results indicate that tagged dysentery endotoxins introduced per os to rabbits are absorbed from the intestinal wall and appear in the blood within half an hour after their administration. This rate of absorption is increased during the first 24 hours after irradiating rabbits with LD_{50}. This process of absorption of dysentery endotoxins is normalized temporarily, then again starting with the end of the first week and for 3-4 weeks after irradiation it becomes intensified.

83. Two Mechanisms Exert Changes on Nucleic Acid Metabolism of Internal Organs Following X-Ray Irradiation of the Head

"Changes in the Metabolism of Nucleic Acids in Internal Organs Following the Effect of X-Rays on the Brain," by Ye. A. Dikovenko, Central Scientific Research Roentgeno-Radiological Institute of Ministry of Health USSR and of Second Moscow Medical Institute imeni N. I. Pirogov (scientific director, Prof L. F. Larionov, Corresponding Member of Academy of Medical Sciences USSR); Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 42-46

Rats were subjected to X-ray radiation of the head while the rest of their bodies were protected. Radiation dose used was 4500 r from a therapeutic apparatus RUM-3, and additional experiments used doses of 600 r. Studies were made of the metabolism of the nucleus of cells of spleen, bone marrow, liver, mucous membrane, and the brain. Radioactive phosphorus (P^{32}) in the form of aqueous solution of Na_2HPO_4 was used as a tracer.

Studies were made of desoxyribonucleic acid, ribonucleic acid fraction, and nucleic acid fractions, and also changes in peripheral blood, such as change in leukocyte count.

Results indicate that irradiation of animals' heads after screening the rest of the body causes a number of changes in the nuclear metabolism of the cells of spleen, liver, bone marrow, and the mucous membrane of the small intestines. The degree and the duration of these changes in nucleic acid metabolism following the radiation of the head depend on the severity of the developing radiation sickness. Changes in the metabolism of nucleic acids are due to at least two mechanisms: first, direct chemical changes in the irradiated tissues; and second, metabolic changes arising due to changes in the neurohumoral regulation and disturbed trophic conditions of centain tissues. Both mechanisms are present in general irradiation, and exert great changes in nucleic acid metabolism.

84. Changes in Latent Period of Flexor Reflex of Rabbits' Shin Good Index for Evidence of Radiation Sickness Due to Irradiation by Small Doses

"Changes of the Latent Period of the Flexor Reflex of the Shin of Rabbits After General Irradiation by 10 r Dose of X Rays," by I. V. Fedorova, Central Scientific Research Roentgeno-Radiological Institute (scientific director, Yu. K. Kudritskiy, Candidate of Medical Sciences) of Ministry of Health USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 32-37

The purpose of the present research was to study the changes in the time of flexor reflexes of rabbits' shin after their general irradiation by a small dose (10 r) of X rays.

Results indicate that the general irradiation of rabbits by small doses of X rays changes the flexor reflex time and that these changes have a wavelike nature for a period of 2 weeks, but the greatest changes occur during the first few days.

This method of measuring (in milliseconds) reflex time is very sensitive and makes it possible to trace the symptoms of radiation reactions, during the dynamic period, after general irradiation by small doses of X rays.

85. X-Ray Irradiation of Rat Brain Early in Postnatal Period Especially Injurious to Development of Cerebrum and Cerebellum

"The Influence of Single Irradiation by X Rays on Developing Brain of Rats," by Ye. N. Kosmarskaya and Yu. I. Barashnev, Division of Development of Brain (director, Prof B. N. Klosovskiy, Corresponding Member of Academy of Medical Sciences USSR) of Institute of Pediatrics of Academy of Medical Sciences USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 23-31

The aim of this research was to study the effect of a single irradiation by X rays (250 and 500 r) on (37) newly born albino rats, on different days during the period of very active postnatal growth (first 17 days of life).

Results prove that the growth of the cerebral hemispheres is disturbed so that they attain a smaller size than normal controls. The medical portion of the occipital lobes was especially small. X rays were especially injurious to the cerebellum, but the corpora quadrigemina was unaffected.

The weight of the rats' brain irradiated on the 1st to the 14th day of postnatal life was less than that of the controls, and the differentiation was retarded. With the dose constant, the earlier the irradiation, the greater was the injury to brain development.

86. Penetrating Radiation Increases Excitability of Hypothalamic Region and Stimulates Pressure, Chemo-, and Thermoreceptors From Small Intestines

"Changes of Reflexes from Intestinal Receptors After the effect of Penetrating Radiation," by T. K. Dzharak'yan, and G. F. Fakhrutdinov, Military-Medical Order of Lenin Academy imeni S. M. Kirov (Leningrad); Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 11-19

The purpose of the present research was to study the possible role of disturbances of visceral reflexes in the development and course of injuries caused by penetrating radiation. Tests were conducted on dogs irradiated by 400 r.

Results indicate that regular changes of reflex reactions caused by the stimulation of pressure, thermo-, and chemoreceptors occurred because of the effect of penetrating radiation. These changes consisted of increased vegetative components (i.e., vasculomotor, cardiac, and respiratory) and of other components (i.e., movements of the head and body), changes of the reflex reaction in response to the effect of threshold value stimulation, and also there was a significant prolongation of the aftereffect period.

Changes in reflexes from intestinal receptors were observed starting with the 6th to the 10th day after irradiation, and the intensity of these changes was commensurate with the severity of radiation sickness.

The authors consider that the increased excitability of the hypothalamic region and disturbances in the functional condition of the subcortical ganglia of the central nervous system conditioned the increased vegetative reaction, thus causing the stimulation of intestinal receptors and their prolonged and wavelike duration.

The article contains graphs illustrating changes in various reflexes and also roentgenograms showing pathological changes in pneumothorax and the gastrointestinal tract.

87. Radiation Reactions and Radiation Sickness Following External Irradiation and Penetrating Radiation Discussed

"Concerning the Problem of Radiation Reactions and Radiation Sickness," by Prof G. A. Zedgenidze, I. S. Amosov, and L. F. Sinenko; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/-Apr 58, pp 3-10

The authors analyze their observations on 950 patients suffering from malignant tumors and being treated by roentgenotherapy. Results of local irradiation by doses totaling 6,000-30,000 r indicate that radiation sickness most often arose due to irradiation of the thoracic and abdominal regions, and never due to irradiation of the extremities, and that acute radiation sickness arose not only due to general external irradiation but also following large doses of penetrating radiation on separate areas of an organism, and especially on the abdominal and thoracic regions.

A mild form of radiation sickness was apparent in 406 of the patients treated by roentgenoradiotherapy for malignant tumors. Greatest incidence for the appearance of radiation sickness was due to therapy of the thoracic region (58.3% of the cases) and the abdominal region (55.9% of the cases treated).

Functional disturbances in the bronchopulmonary system, gastrointestinal tract, liver, gall bladder, and kidneys are discussed. These functional disturbances usually appeared before anatomical changes appeared.

88. Changes in Pulp of Teeth After General X-Ray Irradiation of Animals Studied

"Changes in Pulp of Teeth After the Irradiation of Animals by Roentgen Rays," by Docent Ye. I. Gavrilov, Chair of Histology (head, Prof V. G. Yeliseyev) of First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov (director, Prof V. V. Kovanov) and Chair of Stomatology (head, Docent Ye. I. Gavrilov), Zaporozhe Institute of Higher Training for Physicians imeni M. Gor'kiy (director, V. T. Karpukhin); Moscow, Medgiz, Stomatologiya, No 1, Jan/Feb 58, pp 7-11

Fully grown and newly born dogs were subjected to single general X-ray irradiation doses of 350 r. Three series of experiments were designed to explain the following:

1. To explain the influence of total irradiation by X ray on the rate of cutting milk teeth.

2. To study the condition of the pulp and roots of teeth in acute radiation sickness.

3. To explain the influence of physical factors on the course of inflammatory reaction on tooth pulp.

Results indicate the following: The rate of cutting of teeth was delayed by 5 to 7 days, as compared with normal, due to X-ray irradiation. Although there was no hemorrhage the first 5 days and even up to 20 days after irradiation, the blood vessels were extended and congested with blood. Stained histological sections show serious injury to pulp tissue in acute radiation sickness, and this impeded the course of inflammatory reaction.

The author concludes that the characteristics of inflammatory reaction depend not only on the condition of the macroorganism but also on the nature of the stimuli which reach it.

89. Early Symptomatic Treatment and 12-Day Delayed Surgical Treatment of Maxillary Region in Grave Cases of Combined Radiation Sickness Recommended

"Primary Treatment and Healing of Incised Wounds of the Maxillary Region in Different Stages of Acute Radiation Injury (Experimental Research)," by V. S. Dmitriyeva, Candidate of Medical Sciences, Chair of Jaw-Face Surgery (head, Prof N. M. Mikhel'son) and Chair of Clinical Anatomy and Operative Surgery (head, B. V. Ognev, Corresponding Member of the Academy of Medical Sciences USSR) of the Central Institute for the Advanced Training of Physicians and Central Institute of Traumatology and Orthopedics (director, Prof N. N. Priorov, Corresponding Member of the Academy of Medical Sciences USSR); Moscow, Stomatologiya, No 1, Jan/Feb 58, pp 35-38

Very little research is done on the subject of healing and the periods and methods of primary treatment of wounds of the maxillary region simultaneously with acute radiation injury. To fill such a gap, tests were conducted on 150 rabbits, 70 of which were subjected to superficial or deep incisions, and 60 to contusions and lacerations (20 served as controls). Radiation doses used were 200, 400, and 600 r.

The article discusses the effect of treatment by glucose and salt solutions, vitamins, and antibiotics. The effect of surgical sutures immediately after irradiation and 24 and 48 hours and 12 and 25 days later are discussed and presented in a table.

Data point to the following facts:

1. Individual variation of sensitivity of rabbits to various doses of X rays.

2. Individual variations in changes in leukocytes of the peripheral blood.

3. The fact that in all experimental animals the development of radiation symptoms proceeded parallel to radiation doses.

4. Seriousness of tissue injury affected the course and outcome of combined radiation injury.

5. Time of treatment clearly affected the clinical course of radiation injury.

Results indicate that immediate or early (within 2-3 hours) surgical treatment of experimental animals subjected to low radiation doses (200-400 r) does not worsen their condition, but it aggravates the condition of those animals irradiated with large X-ray doses (600 r) and leads to their death. Therefore, the author recommends that attention should be given to the general building up of a patient's condition and symptomatic treatment at the beginning, while surgical treatment and suturing are postponed for 12-25 days in cases of combined radiation and tissue injuries.

90. Acute Roentgen Radiation Disrupts Bone Marrow Hemoglobinogenic Function

"Synthesis and Dissociation of Blood Hemoglobin in Acute Radiation Syndrome," by A. P. Belousov, M. G. Shitikova, and L. L. Shepshelevich, Tr. Vses. Konferentsii Po Med. Radiol. Eksperim.

Med. Radiol. (Works of the All-Union Conference on Medical Radiology. Experimental Medical Radiology), Moscow, Medzig, 1957, 123-127 (from Moscow, Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 2, 25 Jan 58, Abstract No 2255)

"After general irradiation of dogs by 600 r of roentgen rays, symptoms of inhibition of blood hemoglobin synthesis were evident as early as the period from the second to the third day. Independent restoration of hemoglobinogenic function of bone marrow following lethal doses of radiation did not occur."

91. Changes in Blood, Hemopoietic Organs, and Biochemical Indices Following Experimental Gamma-Irradiation of the Head

"Change in Blood, Hemopoietic Organs, and Certain Biochemical Indices in Experimental Radiation Sickness," by V. A. Fanardzhyan, S. A. Papoyan, K. A. Kyandaryan, I. G. Demirchoglyan, and S. G. Shukuryan, Trudy 1-y Zakavkazskoy Konferentsii po Meditsinskoy Radiologii (Works of the First Transcaucasian Conference on Medical Radiology), Tbilisi, Gruzmedgiz, 1956, pp 151-157 (from Moscow, Referativnyy Zhurnal -- Khimiya Biologicheskaya Khimiya, No 1, 10 Jan 58, Abstract No 914)

"Irradiation of the head of rabbits with large doses of gamma radiation resulted in both quantitative and qualitative changes in the cellular elements of the blood. At the beginning of the experiment a marked increase in the leukocyte count was noted as a result of increased numbers of lymphocytes; at the end of 24 hours there was a sudden drop in the number of lymphocytes and an increase in pseudoeosinophil elements. Changes in the erythrocyte count occurred after irradiation with 20,000-30,000 gamma roentgens. In the majority of rabbits inactivation of catalase occurred by the 3dto 4th day, which was intensified on the 8th day and restored by the 30th day. Reduced activity of carboanhydrase was also noted by the 14th day; it was partly restored by the 16th day. In all animals which received 55,000 gamma roentgens there was marked change in the weight of the spleen -- 600-800 mg instead of the normal 1,300-1,600 mg."

Space Medicine

92. Medical Aspects of Hermetic Cabins

"Problems in Science and Technology: Hermetic Cabin of a Space Vehicle," by V. Borisov, Candidate of Medical Sciences; Moscow, Sovetskaya Aviatsiya, 18 Jun 58, p 3

The following report is a summary of the article:

Research and discussions are being conducted extensively abroad at present to find the most rational method of oxygen regeneration and utilization of various removers of carbon dioxide in hermetic cabins of space vehicles.

Hermetic cabins of ventilating type, now used in aviation, cannot be used in the flying vehicles of the future. This is because it is hardly possible to compress the rarefied upper layers of the atmosphere to a level such that it would have the required pressure.

A hermetic cabin of the regenerative type is deemed to be better suited for vehicles flying at high altitude with a living organism in it. The dog Layka was placed in such a cabin in the second Soviet earth satellite.

What kind of pressure must be maintained in the hermetic cabin of a space vehicle and what must be the chemical composition of the air in it? The most acceptable pressure is one that is half that of the atmospheric pressure.

When creating "synthetic air" in the cabin of the interplanetary vessel, we must consider its thermal conductivity, ability of gases to form isotopes, proneness to spontaneous combustion, and its other properties. Pure oxygen is dangerous, because it may cause fire. In this connection it is considered expedient to fill the future space vehicle with "air" composed of 50% oxygen and 50% helium. Helium possesses considerably greater thermal conductivity than nitrogen. This makes it easier to create conditions for maintenance of normal temperature in the cabin. If cosmic rays penetrate into the cabin, the nitrogen would become transformed into radioactive carbon which is dangerous to human life. This can be avoided if the cabin is filled with a mixture of oxygen and helium.

To maintain the necessary temperature in a hermetic cabin that could be well tolerated by a human being is difficult and complicated. In an interplanetary flight the principal source of heat will be solar radiation, the intensity of which is quite great.

It is necessary to take into consideration also that on entry of the space ship into dense layers of atmosphere the temperature of its surface will increase considerably. This would make it very difficult to maintain normal temperature in the interior of the cabin. How can that be prevented? It has been suggested that an outlet for heat within the cabin can be created with the aid of liquid flowing from the radiator. The radiator is to be situated on that side of the space vehicle that is not exposed to light.

Exploiting Tsiolkovskiy's idea concerning creation of "artificial atmosphere" by means of photosynthesis, some foreign scientists propose to use algae as a source of oxygen and as removers of carbon dioxide. Research in that field has just begun. Many obstacles must be overcome in conducting those experiments, because the plants are very sensitive to changes in temperature and light.

In the early flights into interplanetary space the space crew will probably be small and room in the cabin will be limited. Exposure of human beings to conditions like that, for a period of several days, will create a definite strain on their organism and cause considerable fatigue. Studies have been conducted abroad in that field, using airmen as subjects of experiments. Airmen were placed in specially constructed cabins where they stayed up to 120 hours.

An experiment lasting longer than that was conducted in February 1958 in the School of Space Medicine of the US Air Force. A man was exposed to conditions closely resembling those that are encountered in outer space. He remained in a specially constructed hermetic cabin which was 183 centimeters long, 152.5 centimeters high, and 91.5 centimeters wide. The man breathed artificially created air and was isolated from the entire world. He was permitted to sleep in a sitting position and was given specially devised concentrated food of high caloric value. Although his movements were restricted and a special regime of feeding was observed, he lost 1,600 grams of weight. Pressure in the cabin was half that of the outside atmosphere, i.e., it was 380 millimeters of a mercury column which corresponds to an "altitude" of 5,500 meters. In this connection the percentage of oxygen content in the cabin was almost twice that in the atmospheric air; the temperature maintained at 21°C and humidity of the air within the limits of 30%-60%. Carbon dioxide and products of excretion were removed automatically.

The cabin was brightly illuminated during the entire experimental period. This completely disoriented the subject of the experiment during the 7 days that he stayed in the hermetic cabin.

The pulse frequency, respiration, and body temperature were recorded continually during the entire experimental period. The airman carried out "secret military reconnaissance missions out in cosmic space," watched the radar screen, and used "secret instruments." The airman emerged well and healthy from the hermetic cabin after staying there 7 days.

Flights have been made abroad in stratosphere balloons to solve the biological problems involved at extremely high altitudes. In August 1957 an airman took off in a hermetic cabin of a stratosphere balloon which reached an altitude of 30,000 meters. He remained aloft for 32 hours. Aside from a study of the effects of radiation on a human organism confined in a hermetically sealed cabin and flying at high altitude, the effects of heavy particles of cosmic radiation on man were also investigated.

For protection the airman was dressed in an altitude suit so that in the event of dehermetization of the cabin he would be able to abandon the stratosphere balloon and escape rapidly.

In that experiment his escape was delayed by adverse meteorological conditions and because the air regeneration device was not operating well enough. For this reason concentration of carbon dioxide in the hermetic cabin reached 4%. Respiration frequency in the airman increased to 44 per minute. The airman landed safely just the same.

After physiological data were deciphered and a medical examination of the airman made, the scientists responsible for the experiment came to a conclusion that a human being can remain safely in outer space for a long period of time. This statement, of course, can hardly be considered sufficiently substantiated. Many scientists are inclined to think that considerably greater research is yet necessary before such a conclusion can be depended on.

It is necessary to bear in mind that conditions must be created for breathing in a hermetic cabin if it is to be made safe. It is also important that the cabin be detachable in case it becomes necessary for its occupant to get back to earth safely.

Invention of a hermetic cabin and creating in it the necessary conditions which would permit man's ascent to the outmost regions of the earth's atmosphere is still a needed area of research in any plan for manned interplanetary flight. Still greater efforts must be exerted by scientists, engineers, and physicians to achieve this.

A drawing, showing a man inside the hermetic cabin, is presented in the text. This drawing is labeled, showing the following:

1 and 6. Air intake
2. Oxygen delivery panel
3. Emergency bottle
4. Carbon dioxide absorber
5. Electric instruments
7. Radio receiving set
8. Water
9. Electric battery

Surgery

93. Revival by Blood Substitutes, Blood Plasma, and Hypothermia Discussed

"Revival by Blood Substitute Solutions, "Rozhledy Chir., 1957, 36, 4, 243-252 (Czech) (from Moscow, Meditsinskiy Referativnyy, Zhurnal, No 9, Section 2, Sep 57, p 9)

The author conducted a series of experiments on dogs in which various solutions (physiological salt solution, Ringer-Locke's, blood plasma, dextran, etc.) were tested for revival purposes. It was evident that plasma effects resemble those of whole blood, but erythrocyte mass must be added in cases where the hematocrit is low. Complex solutions exert positive effects in 66-77% of the cases, but simple solutions seem ineffective for revival purposes.

Additional research was conducted on the effect of hypothermia following revival. In all cases, when body temperature was lowered to 26° animal survival was 33%, whereas when the temperature was lowered only to 32°, survival rose to 90%.

94. Clinical Tests Prove Rapid Intravenous Superior to Intra-arterial Transfusion in Treating Severe Hemorrhage

"Clinical Tests for Treating Severe Hemorrhages," Rozhledy Chir., 1957, 36, 4, 235-242 (Czech) (from Moscow, Meditsinskiy Referativnyy Zhurnal, No 9, Section 2, Sep 57, p 9)

"Observations were conducted on 62 patients suffering from severe hemorrhage of various etiology. A new method of rapid intravenous infusion was used. Where the bad condition of the patient was due solely to blood loss, this method of therapy was completely effective. The infusion rate rose up to 6 6.5 ml per minute. Greatest quantity of fluid transfused by this rapid method was 18 liters (16 liters of blood plus 2 of blood substitute).

"This method of rapid intravenous transfusion is distinguished for its simplicity, and has a number of advantages over that of intra-arterial transfusion."

95. Supertransfusion Recommended for Treating Posthemorrhagic Shock

"Concerning the Problem of Pathogenesis and Therapy of Hemorrhage," Rozhledy Chir., 1957, 36, 4, 225-234 (Czech) (from Moscow, Meditsinskiy Referativnyy Zhurnal, No 9, Section 2, Sep 57, p 9)

Tests on 210 dogs, according to the opinion of the author, indicate that for treating severe blood loss quick blood transfusion is necessary. To treat posthemorrhagic shock the author recommends supertransfusion, i.e., transfusion of blood in amounts that exceed the volume lost. The author discovered also that, for the immediate treatment of hemorrhage, if the level of erythrocytes is not less than 20-30% of the normal, the use of blood substitutes is as effective as that of whole blood; but if whole blood is not available for immediate therapy, blood substitutes may be transfused plus a supplement of erythrocyte mass.

96. Shock Therapy by Mixture M-II, Morphine, Atropine, Alcohol, and Pentamethonium

"Concerning the Effect of Neuroplegic Drugs on Shock," Rozhledy Chir., 1957, 36, 4, 197-208 (Czech) (from Moscow, Meditsinskiy Referativnyy Zhurnal, No 9, Section 2, Sep 57, pp 9-10)

"The authors conducted experiments on the effect of certain drugs on the course of shock condition. Shock due to burns and traumas were treated with mixture M-II, morphine, atropine, alcohol, and pentameton (pentamethonium).

"Results of using M-I mixture were less favorable than results from using alcohol. For clinical use, the authors think it is advantageous to use mixture M-II and a combination of morphine and atropine. For treating shock they recommend a more extensive use of alcohol infusion."

97. Method and Clinical Experience of Inducing Artificial Hybernation Described

"Clinical Experience With Artificial Hibernation," Rozhledy Chir., 1957, 36, 4, 214-218 (Czech) (from Moscow, Meditsinskiy Referativnyy Zhurnal, No 10, Section 2, Oct 57, p 9)

"Results of subjecting nine patients to artificial hibernation are reported. Hibernation, which lasted 1-4 days, was induced in three patients for therapeutic purposes and in six patients for surgical operations on malignant neoplasms. Minimum body temperature was 30.7°. Five of these patients subjected to artificial hibernation died.

"Agents producing artificial hibernation used were a mixture of M-I with largactil and M-II with hydergine. The hibernation method using mixture M-II and hydergine is described. At night phenobarbital and hydergine were administered intramuscularly, and early in the morning solution M-II containing, instead of largactil, either hydergine or the Czech preparation called dihydroergotoxin. The mixture was administered intramuscularly or intravenously. A 1% mixture of procaine and vitamin B_1 were added to this mixture during surgery."

Miscellaneous

98. Annual Conference of Laboratory of Experimental Physiology for Resuscitation of an Organism, Academy of Medical Sciences USSR

"The Problem of the Resuscitation of an Organism and Its Study," by N. S. Kolganova; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 2, 1958, pp 83-85

The regular annual scientific conference of the Laboratory of Experimental Physiology for Resuscitation of an Organism, Academy of Medical Sciences USSR, was held from 23 to 25 October 1957. The conference was attended by representatives of medical institutions and hospitals from Moscow, Leningrad, Voronezh, and Uzhgorod.

Eighteen reports were presented concerning the study of the dynamics of change occurring in an animal organism after its clinical death due to blood loss under conditions of hypothermia, and on the study of the process of dying and the subsequent re-establishment of the life function of an organism under various conditions.

The following persons gave reports: V. A. Negovskiy and V. I. Soboleva; M. S. Gayevskaya; Ye. A. Nosova; T. Ya. Ital'yantseva; O. N. Bulanova and A. M. Gurvich; A. I. Makarychev, A. V. Popova, and T. N. Grozdova; M. A. Usiyevich; Ye. S. Zolotokrylina; N. P. Romanova; L. G. Shikunova; N. L. Gurvich and N. S. Kolganova; V. A. Negovskiy, K. S. Kiseleva, Ye. S. Zolotokrylina, L. V. Lebedeva, N. M. Ryabova, and L. G. Shikunova; Ye. M. Smirenskaya; L. N. Syryatskaya; and V. F. Doroshchuk.

99. New Scientific-Popular Medical Periodical Published in Latvia

"Scientific-Popular Medical Periodical in Latvia" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 50, 24 Jun 58, p 2

The first issue of the scientific-popular medical periodical, Veseliba (Health) has appeared on the newsstands in Riga. The periodical is an organ of the Ministry of Health Latvian SSR, and will appear monthly. The periodical will include articles by leading medical scholars, teachers of higher schools, and practicing physicians.

100. East German Scientist Celebrates 70th Birthday

"Dr Hertwig Celebrates His 70th Birthday" (unsigned article); Halle, Der Neue Weg, 10 Mar 58

Dr Guenther Hertwig, professor emeritus of anatomy and biogeny at Martin Luther University, Halle-Wittenberg, will celebrate his 70th birthday on 10 March. He is a member of the Leopoldina German Academy of Natural Scientists and an honorary member of the Anatomical Society.

101. Czechoslovakia Honors Soviet Scientists

"Honorary Doctorates of Medical Sciences to Two Soviet Scientists" (unsigned article), Prague, Obrana Lidu, 21 May 58, p 1

On 2 May 1958, Charles University (Karlova universita) in Prague awarded honorary doctorates of medical science to two outstanding Soviet physiologists. The high honor was paid to Khachatur Sedrakovich Koshtoyants, Corresponding Member of the Academy of Sciences USSR, Academician of the Academy of Sciences Armenian SSR, and a professor at the Moscow State University imeni V. M. Lomonosov, and to Prof Dmitriy Andreyevich Biryukov, Corresponding Member of the Academy of Medical Sciences USSR and director of the Institute of Experimental Medicine, Academy of Medical Sciences USSR in Leningrad.

VII. METALLURGY

102. Review of Work on Cermets and Powder Metallurgy

"Cermet Materials for the Chemical Industry" by G. V. Samsonov, Cand Tech Sci, and S. Ya. Plotkin, Candidate of Technical Sciences; Moscow, Khimicheskaya Promyshlennost' No 2, Mar 58, pp 106-110

Applications of cermets and powder metallurgy in the production of materials used in the chemical industry are reviewed on the basis of USSR and Western publications. Information is given on alloys of titanium, tantalum, niobium, tungsten, and molybdenum and also on carbides, nitrides, borides, and silicides of metals and nonmetals. A bibliography consisting of 15 USSR references and 13 non-USSR references is appended to the article. The authors point out that in addition to corrosion-resistant materials, heat-resistant materials are also produced by the methods described.

103. Importance of Powder Metallurgy for New Technological Applications

"For a Powerful Powder Metallurgy in Our Country," by Engineers S. Chorkesov and I. Korotin; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 20, 14 Feb 58, p 3

When machine parts are made of cermets by powder metallurgy methods, mechanical working is eliminated almost entirely. Furthermore, the labor which has to be done is reduced and hundreds or thousands of tons of rolled ferrous and nonferrous metals are saved. A distinguishing trait of powder metallurgy is the possibility of producing with its aid new materials for technological applications which possess novel physical characteristics that cannot be obtained by working the metal by ordinary methods, namely casting, forging, rolling, etc.

Recently, methods for the manufacture of new products by means of powder metallurgy have been developed. In this manner, many important problems in new fields of technology could be solved. For instance, it became possible to produce heat-resistant alloys to be applied in the construction of reaction motors, of high-efficiency furnaces operating at high temperatures, and of nuclear reactors. These heat-resistant alloys consist of metals and nonmetals which do not react with each other. With the aid of powder metallurgy methods, materials with a very high magnetic coercivity, highly efficient cutting tools from solid alloys, friction materials which have a high coefficient of friction and exhibit a low rate of wear at high braking temperatures, porous cermet antifriction materials to be used as linings for bearings, etc. can also be produced.

By using powder metallurgy, the USSR electric industry produces tungsten filaments for incandescent lamps.

Furthermore, the electrical industry produces with the aid of powder metallurgy contact materials consisting of tungsten-silver, tungsten-copper, and other components, as well as copper-graphite and bronze-graphite brush contacts. The use of self-lubricating porous linings for bearings presents great possibilities. Porous bearings produced by the method of powder metallurgy are impregnated with lubricating oil and used whenever lubrication by ordinary means is difficult or cannot be applied at all.

Cermet filters made of brass, bronze, and stainless steel powders have acquired great importance for various industrial applications. Such filters are used for the purification of liquids, air, and gas from solid particles and dust at air-conditioning plants, the filtration of air and of liquid oxygen at oxygen-producing plants, the filtration of freon in refrigerators, etc.

In high-temperature technology, porous materials made of stainless steel are used which are cooled as a result of the evaporation of liquid introduced into the pores. Materials of this type make it possible to utilize the cooling effect of liquids with an efficiency which is dozens of times greater than that obtained when ordinary methods of cooling are used.

Shortcomings exist in the USSR as far as the development of powder metallurgy is concerned. The supply of iron and nonferrous metal powders is inadequate, and the production of cermet products is not extensive enough. Departments for the production of cermet machine parts have not been built at a number of automobile and tractor plants.

Furthermore, measures have not been taken for designing and organizing the production of automatic mechanical and hydraulic 16-, 25-, 40-, 100-, 250-, 500-, and 1,000-ton duplex action presses. Work is also lagging on the modernization and creation of new types of mechanized sintering furnaces with the automatic control of thermal cycles.

The development of powder metallurgy is impeded by the high cost of iron powders and their low quality. Furthermore, there is a strong lag in the production of nonferrous metal powders and of heat-resistant and corrosion-resistant alloys. In view of the fact that the development of powder metallurgy on a large scale cannot be delayed, the USSR Gosplan [State Planning Commission] and the gosplans of the union republics must pay closer attention to the matter. USSR metallurgists must improve old methods for the production of iron powders and also expand the volume of the production of nonferrous metal powders. Practical workers in the field of powder metallurgy must solve a number of problems, specifically those pertaining to a unified theory of sintering. Such a theory forms the basis for the production of cermet alloys and cermet products.

Work on theoretical and technological problems involved in powder metallurgy and coordination of scientific research work in the field should be the responsibility of the Academy of Sciences USSR acting in conjunction with the USSR Gosplan and the State Scientific Technical Committee at the Council of Ministers USSR.

104. Vacuum Processes in Nonferrous Metallurgy

"On the Application of Vacuum Processes in the Metallurgy of Nonferrous Metals," by I. A. Onayev, M. A. Abdeyev, V. S. Yesyutin, and V. A. Vasil'yeva; Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, Vol 14, No 1 (154), Jan 58, pp 40-47

After pointing out that separation and refining of metals by the vacuum method is already being applied in industrial practice (for instance, in the metallurgy of aluminum and magnesium), the authors review future possibilities in this field and discuss developmental work being done at present in Kazakhstan on the concentration, separation, and refining of metals by vacuum distillation. The distillation and/or sublimation of metals and nonmetals (including Cd. Li, Se, and Te), metal oxides (including CdO), sulfides (including CdS), and metal chlorides (including $BeCl_3$, $CdCl_2$, and $GeCl_4$) is considered. It is stated that vacuum processes in the metallurgy of heavy nonferrous metals have been applied hitherto in the USSR only in the treatment of lead ores (principally the distillation of zinc and lead and the separation of zinc from lead).

It is mentioned that research has been done in the USSR in recent years on the vacuum separation of cadmium from zinc. According to the article, work is being done at present at the Altay Mining and Metallurgical Institute on the vacuum separation of cadmium from intermediate products of zinc production which contain copper and zinc.

VIII. PHYSICS

Atomic and Molecular Physics

105. Quadrupole Interaction Constants of U-233 Determined

"Determination of Quadrupole Interaction Constants of the Isotope U-233 by Means of the Method of Optical Atomic Spectroscopy," by N. M. Yashin; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 409-416

An attempt is made to determine constants of the quadrupole interaction of levels with known electron configuration by studying in more detail the superfine structure of U-233 lines, previously investigated by the author and others (ZhETF, 28, 471, 1955); by N. I. Kaliteyevskiy and M. P. Chayka (DAN SSSR, 103, 49, 1955); and by K. L. V. Sluis and others (J. Opt. Soc. Am., 44, 87, 1954). All lines exhibited a six component structure, confirming the previously found nuclear spin of U-233, I = 5/2. In spark lines (U II) the superfine structure originates in the splitting of lower, as well as higher, levels. Numerical values were obtained of the constant of the quadrupole electric interaction of the two deepest levels 6L 11/2 and 6L 13/2 which, respectively, are $(-5.5 \pm 1.5) \cdot 10^{-5} cm^{-1}$ and $(-1.7 \pm 0.7) \cdot 10^{-5} cm^{-1}$.

106. Energy of Symmetrical-Rotator-Type Molecule in an External Electric Field Determined

"The Energy of a Molecule of a Symmetrical Rotator Type in an External Electric Field," by G. M. Genkin; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 530-534

The energy of a nonlinear molecule of a symmetrical rotator type in an external constant electric field is found, as well as the transition to linear molecules and the energy of linear molecules in the field. Comparison is made with Lamb's results (H. Hughes, Phys. Rev., 72, 614, 1947). Derived formulas allow numerical computations of energy curves of concrete nonlinear molecules of a symmetrical rotator type, because their parameter includes the ratio of rotation constants of molecules.

107. Correlations Between Absorption and Emission Spectra

"General Correlations Between Absorption and Emission of Modulational Spectra of Multiatomic Molecules," by B. S. Neporent; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 4, 1 Apr 58, pp 682-685

It is suggested that the problem of the correlation of the adsorption and emission spectra of multiatomic molecules be solved in the same way as it is done for a system with narrow levels. By analyzing molecules in radiative equilibrium and after having obtained characteristics of the separate molecules, we should use them in the analysis of luminiscence excited in the stationary state. The general expressions obtained describe the correlations between the absorption and emission of multiatomic molecules with modulational spectra.

108. Exciton Energy Calculated

"Exciton Energy in Ionic Crystals," by V. A. Moskalenko, Moscow State University imeni Lomonosov; Moscow; Doklady Akademii Nauk SSSR, Vol 119, No 4, 1 Apr 58, pp 678-681

The first attempt to obtain a general expression of the energy of the exciton in ionic crystals at ground state with arbitrary bonds was made by H. Haken (Zs.f. Phys., 147, 323 1957) and A. Kasiyan, but their work does not provide a full solution of the problem. In this article, an expression is derived from the energy and effective mass of the exciton without limitations due to the value of the bond and temperature constant. The results are considered to be more accurate than those found by the perturbation theory.

Nuclear Physics

109. Hyperfragments Observed in Nuclear Emulsions Analyzed

"Hyperfragments in Nuclear Emulsions," by B. P. Bannik, U. G. Gulyamov, D. K. Kopylova, A. A. Nomofilov, M. I. Podgoretskiy, B. G. Rakhimbayev, and M. Ustanova, Joint Institute of Nuclear Research and Tashkent Physicotechnical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 2, Feb 58, pp 286-297

Ten hyperfragments observed in nuclear emulsions which were exposed to cosmic rays in the stratosphere are examined. The hyperfragments satisfy the criteria proposed by A. Filipowski, J. Gierula, and P. Zielinski

(Acta Phys Polon, 16, 139, 1957). Five of them underwent meson decay and the remaining, mesonless. A description and analysis of the ten events are given. In addition, the disintegration of τ -mesons, τ'-mesons, Λ -particles, K-mesons, and Σ -hyperons, all observed in the same series of exposures, is briefly discussed.

110. Values Found for Parameters in Electron Distribution Law of Mu-Meson Decay

"Asymmetry of Angular Distribution of Electrons From $\mu^+ \rightarrow e^+$- Decay on the Basis of Observations in Photographic Emulsions," by I. I. Gurevich, V. M. Kutukova, A. P. Mishakova, B. A. Nikol'-skiy, and L. B. Surkova, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 2, Feb 58, pp 280-285

The angular distribution of electrons from $\mu^+ \rightarrow e^+$ -decay was studied using photographic emulsions. Values are found for a in the formula

$$1 + a \cos\Theta \ , \ a = (\lambda/3)(1 - \gamma),$$

describing the angular distribution of electrons in $\mu \rightarrow$ e-decay. In the above expression, γ is the depolarization coefficient for μ -mesons, Θ is the angle between the direction of the electron and the spin of the μ -mesons, and λ is the relative contribution of vector and pseudo-vector interaction in the β -decay of μ -meson. Two different values of a were found for an emulsion in a magnetic shield and in a magnetic field of 1,100 G.

111. Scattering Amplitudes of Photons on Nucleons

"Approximate Equations for the Scattering Amplitudes of Photons on Nucleons," by A. N. Tabkhelidze and V. K. Fedyanin, Joint Institute of Nuclear Research; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 4, 1 Apr 58, pp 690-693

Approximative equations of physical amplitudes are obtained on the basis of dispersive correlations for Compton scattering. The kinematic amplitude is analyzed, and the dispersive correlations for relativistic as well as for physical amplitudes are derived.

112. "Sampler" Used on Aircraft to Detect Nuclear Explosions

"How They Find Out About Atomic and Thermonuclear Explosions," by M. Neyman, Doctor of Chemical Sciences; Moscow, Sovetskaya Aviatsiya, 30 Mar 58, p 4

An instrument called a sampler and used for detecting atomic and nuclear explosions is described. It is mounted in the wing of an aircraft. A shutter in the front of the instrument is opened by the pilot and the air which is sucked into the sampler passes through a paper filter. The plutonium, uranium 235, and fission fragments which collect on the filters are examined with a special radiometer and their nature determined. After passing the filter, the air goes through an alkaline solution and radioactive carbon dioxide is absorbed. The presence of large amounts of radioactive carbon indicates that the exploded bomb was thermonuclear.

113. Multiple Scattering of Protons in Lead and Copper Measured

"Investigation of the Multiple Scattering of Protons," by F. R. Arutyunyan, Physics Institute, Academy of Sciences Armenian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 800-806

The multiple scattering of 90-200 Mev protons in lead plates and of 40-60 Mev protons in copper plates was investigated. Plate thickness varied from 7 to 2 mm. Curves of the differential distribution of the scattering angles are given.

The experimental data are compared with the multiple Coulomb scattering curves for point nuclei and extended nuclei. Disagreement between the experimental and theoretical values for nuclei of finite dimensions is attributed to the occurrence of diffraction scattering.

The integral cross section of nuclear scattering of protons is found in the angle region where Coulomb scattering is small in comparison with nuclear scattering. This value is found to be in good agreement with the value predicted by the optical model for an "absolutely black" nucleus.

114. Electron Yield From Aluminum Bombarded by Gamma Quanta Measured

"Electron Yield Under the Action of Gamma-Quanta," by M. V. Khatskevich and E. M Tsenter; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 807-810

The absolute yield of electrons from an aluminum target under the influence of 2.62-Mev gamma quanta was measured. A value of 1.3 ± 0.2 electrons per quantum was obtained. Agreement with the theoretical value of 1.6 electrons per quantum is termed satisfactory. Data from the literature on the absorption of monochromatic electrons was used in the calculations.

The possibility of obtaining absolute values for these quantities on the basis of data for various elements is proposed by the authors.

115. New Method of Determining the Constant of Nuclear Magnetic Screening

"Computation of the Constant of Nuclear Magnetic Screening," by I. V. Aleksandrov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 4, 1 Apr 58, pp 671-674

To analyze spectra of nuclear magnetic resonance, a knowledge of the constant of magnetic screening is of importance, because it determines the value of the chemical shift of lines. Both known methods of determining this constant, one based on the theory of disturbances (N. E. Ramsey, Phys. Rev., 77, 567, 1950; 78, 699, 1950; 83, 540, 1951; 86, 243, 1952) and the other using the variational principle (J. F. Hoenig, J. Hirschfelder, J. Chem. Phys, 23, 474, 1955; B. R. McGarvey, J. Chem. Phys., 26, 221, 1957; 27, 68, 1957), are considered unreliable. A new method of determining the constant of magnetic screening is suggested, which is based on the method of molecular orbits. As an example, the constant of magnetic screening is computed for the hydrogen molecule, using a simplified expression of effective potential.

116. Internal Conversion Electrons Used to Study Lower Excitation Levels

"Study of Lower Excited Levels of U^{235} From Internal Conversion Electrons," by Ye. F. Trem'yakov, G. I. Grishuk, and L. L. Gol'-din; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 811-819

The internal conversion electrons emitted by excited U^{235} nuclei following the alpha decay of Pu^{239} were studied. The results were compared with theoretical values for the coefficients of internal conversion in the L_I-, L_{II}-, and L_{III}-shells, and the multipolarity of the transitions was established and the spin and parity of the first six levels were determined.

It was shown that the first five levels form a rotation band with $K = 1/2$. More exact values for the energies of the excited levels were obtained.

117. Bubble Chamber Study Gives Further Evidence of Parity Nonconservation

"Angular Correlations of $\pi^+ - \mu^+ - e^+$-Decays in Propane Bubble Chamber," by V. V. Barmin, V. P. Kanavets, B. V. Morozov, and I. I. Pershin; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 830-835

A total of 6,760 cases of $\pi^+ - \mu^+ - e^+$-decay were photographed in a 2-liter propane bubble chamber. The value of a in the formula for the angular distribution of positrons

$$dN = (1 + a \cos\theta)\, d\Omega / 4\pi$$

was determined to be -0.19 ± 0.03, for propane.

It is claimed that this result confirms Lee's and Yang's hypothesis of parity nonconservation in weak interactions.

118. Further Evidence of Parity Nonconservation in Weak Interactions

"Polarization of Electrons in β -Decay," by A. I. Alikhanov, G. P. Yeliseyev, V. A. Lyubimov, and B. V. Ershler, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 785-799

Experiments to determine the longitudinal polarization of β -electrons, a phenomenon predicted by theory in connection with the hypothesis of parity nonconservation in weak interactions, are described and analyzed. A brief account of this work was delivered by the USSR delegation at the Rochester Conference in 1957. Several errors which appeared in this account have been corrected.

The azimuthal asymmetry in the one-dimensional scattering of electrons through an angle of approximately 90° was the phenomenon used to determine the longitudinal polarization of electrons in β -decay. To obtain electrons with a spin component perpendicular to the velocity, the longitudinal polarization of the electrons was transformed into transverse polarization. This was done by passing an electron beam through intersecting electric and magnetic fields which rotated the spin with respect to the direction of the electrons without any change, to a first approximation, in the direction of the electrons. The formulas describing the change in spin orientation were derived by K. A. Ter-Martirosyan. The deriviation is given in an appendix to the article. It was found that electrons are emitted with a spin counter to the direction of their motion. The degree of longitudinal polarization was consistent with the -v/c law to an accuracy of 15% for electrons with a mean energy of 300 kev and 40% for electrons with a mean energy of 750 kev. It is commented that the results of this and other experiments are strong evidence of the nonconservation of parity in weak interactions.

119. Czechoslovak Paper Reports East German Microscope Development

"It Measures Atomic Nuclei" (unsigned article); Prague, Lidova Demokracie, 12 Apr 58, p 2

"The 'Carl Zeiss' Factory in Jena placed into operation a nucleus-measuring microscope by which it is possible to measure atomic nuclei at energies up to 100 billion electron volts."

120. Paramagnetic Resonance Method Used in Study of Activator in Phosphors

"Application of the Method of Paramagnetic Resonance to the Investigation of the Activator in Phosphors," by A. A. Manenkov, A. M. Prokhorov, Z. A. Trapeznikova, and M. V. Fok; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 470-474

The method of paramagnetic resonance is applied to the study of absorption lines corresponding to magnetic dipole transitions between the lower levels of energy of paramagnetic ions under a constant exterior magnetic field. Phosphor powders SrS-Eu, SrS-Gd, and SrS-Tb were tested as well as artificial single crystals CaF_2 activated by Eu. The study of spectra of paramagnetic resonance of SrS-Eu and CaF_2Eu supplied the absolute value and the sign of ratio of nuclear magnetic moments of two isotopes Eu: $\mu_{151} / \mu_{152} = +2.24 \mp 0.03$. It was attempted to reveal variation of the valency state of the activator by exciting phosphors SrS-Eu, Sm and SrS-Tb, Sm.

121. Improved Complex Interference Light Filters

"Complex Interference Light Filters With Improved Characteristics," by K. D. Sinel'nikov, I. N. Shklyarevskiy and N. A. Vlasenko, Khar'kov State University; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 534-536

The authors continue their previous studies (Uch. zap. Kharkovsk. Univ., Tr. fiz. otd. 6, 147, 1955; ZhTF, 26, 96, 1956) of complex interference filters $M_1 D_1 M_2 D_2 M_3$, where M_1, M_2, M_3 are reflecting layers and D_1, D_2 are dielectric layers. The special filter described here was prepared by taking two simple filters $D_1 M_1 M_2$ and compressing them as to form a wedgelike air gap between the M_2 layers. Such a complex filter was fixed before the slit of a DFS-4 spectrometer with automatic recorder. It narrows the half-width of the passing band and provides better contrast of the pattern.

122. Luminescence of Ice in an Electric Field

"Luminescence of Ice in a Strong Electric Field," by A. V. Astafurov, Tomsk Polytechnic Institute, Laboratory of High-Tension Techniques; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, p 540

The author revealed luminescence of ice while testing electric strength of thick ice. The luminescence starts at a pulse front length of 3 to 4.10^{-7} sec and an amplitude over 70 kv. The intensity of luminescence increases with lowering of the temperature.

123. Spectrophotometry of Light Scattering Media

"Some Problems of Spectrophotometry of Light Scattering Media," by A. P. Ivanov; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 524-529

The problem of best response of spectrophotometric methods of light scattering media is analyzed with respect to the absorption index of the dispersed medium and the reflection coefficient of the powder. The most suitable function $f(R)$ which will best represent the absorption spectrum using the absorption characteristic $K(\lambda)$ obtained from reflection spectra $R(\lambda)$ is $f(R) = \frac{(1-R)^2}{R}$.

124. Optics of Uniaxial and Unirefracting Magnetic Crystals

"Optics of Magnetic Crystals. III. Uniaxial and Unirefracting Magnetic Crystals," by F. I. Fedorov, Institute of Physics and Mathematics, Academy of Sciences Belorussian SSR; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 514-523

In previous articles (ibid., 1, 926, 1956; ibid., 2, 361, 1957) the author developed a general theory of optical properties of transparent magnetic crystals. The present article analyzes a particular case of magnetic anisotropic media in which the tensor determining the optical properties of the crystals has two coinciding proper values. In such crystals birefringence and linear polarization should not exist.

A classification of magnetic crystals according to their optic properties, which substantially differs from similar characteristics of nonmagnetic crystals, is presented. One type are optically isotropic magnetic crystals with cubic syngony and tensors differing from a unique tensor only by a numerical factor. The possibility of existence of another type is principally established. These are unirefracting magnetic crystals in which all three proper values of the tensor coincide. In this case each direction has its unique speed of light and birefringence and linear polarization are inexistent. Other types are uniaxial magnetic crystals in which the tensor has only two different proper values, one of which is double (such crystals have only one binormal); and biaxial magnetic crystals in which the tensor has three different proper values (such crystals have two binormals and two biradials). Their optic properties are complex.

125. Depolarized Light Scattering in Liquids Studied

"Depolarized Light Scattering in Liquids and Relaxation Processes," by I. L. Fabelinskiy, Physics Institute imeni Lebedev, Academy of Sciences USSR; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 510-513

An attempt is made to explain the wing of the Rayleigh line of light scattering in a liquid. The author together with G. A. Shustin (Izv. AN SSSR, Ser. fiz., 87, 538, 1953) devised a direct interference method of experimental study of the wing of the Rayleigh line and he revealed that an intensive section of depolarized light adheres to the unshifted line. The results of determination of the relaxation time in liquids of low viscosity obtained by the above method are tabulated in a range from 0 to 60 cm^{-1}.

126. Determination of Optical Anisotropy and Polarizability Tensor of Molecules

"Determination of Optical Anisotropy and Polarizability Tensor of Molecules by Means of Light Scattering in Solutions," by I. A. Bogdanov, M. F. Vuks and V. I. Yelfimov, Leningrad State University, Military Academy of Rear Services and Transport; Leningrad, Optika i Spektrografiya, Vol 2, No 4, Apr 57, pp 502-509

The method of light scattering of solvents proved suitable for determining the optical anisotropy of molecules and is particularly advantageous in treating substances which are difficult to study in the vapor phase. The comparison of optical anisotropy of mono- and disubstituted derivatives of benzene, studied by light scattering of solvents, exhibited in all cases a deviation from additivity. It proves a noticeable interaction of bonds.

127. Tables of Polarizability of C-H and C-C Bonds Revised

"Additivity of the Polarizability Tensor and the Polarizabilities of Bonds," by M. F. Vuks, Scientific Research Physics Institute, Leningrad State University; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 494-501

The main polarizabilities of C-H and C-C bonds are computed again on the basis of CH_2 group and methane and ethane molecules, because the available tables by K. G. Denbigh (Trans. Farad. Soc., 36, 936, 1940) are considered not accurate enough. The results show that in the mentioned tables the anisotropy of these bonds has been given a slightly too high value. The improved tables of polarizability of bonds and additive valency-optical schematic are used for computing the values of optical anisotropy of a series of paraffin and alcohol molecules. The newly obtained data are in good agreement with experimental data.

128. Luminescence Spectra of Plastic Scintillators Studied

"Luminescence Spectra of Plastic Scintillators with Triphenylpyrazoline," by Ye. A. Andreyeshchev and I. M. Rozman; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 488-493

Luminescence spectra of plastic scintillators on polystyrol base with addition of triphenylpyrazoline were studied by means of a monochromator and a photoelectron multiplier. The luminescence was excited by beta-particles or by mercury lines of 2537 and 3650-3663Å. It was

found that the energy migration on account of absorption by triphenylpyrazoline of the polystyrol luminescence plays a secondary role. Not below 80% of triphenylpyrazoline luminescence originates in radiationless transfer of excitation energy even at low concentration of triphenylpyrazoline (10^{-3} gr/gr).

129. Temperature Dependence of Luminescence in Plastic Scintillators Studied

"Temperature Dependence of Luminescence in Plastic Scintillators With Triphenylpyrazoline," by I. M. Rozman; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 480-487

This study is of interest for scintillation counters as well as for explanation of the radio luminescence mechanism. Luminescence was excited by ultraviolet, gamma, beta, and alpha emission. It was found that the dependence of radio luminescence of polystyrol on temperature coincides with temperature dependence of photoluminescence. The noticeable drop of dependence of luminescence of plastic scintillators on polystyrol base with increasing concentration of triphenylpyrazoline is connected with the presence of radiationless excitation energy migration from the first substance to the second.

130. Interaction of Centers of Blue and Green Luminescence in ZnS-Cu Phosphor

"Interaction of Centers of Blue and Green Luminescence in ZnS-Cu Phosphor," by M. V. Fok, Physics Institute, Academy of Sciences USSR; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 475-479

The interaction of centers of blue and green luminescence occurs by means of hole migration in the valency zone from one center to the other. It was found, in agreement with computations, that, on excitation in the absorption band of blue centers, the extinction of the blue band is delayed at a certain instant and continues in parallel to the green one. It is possible to excite the blue band even on absorption of the exciting light by centers of the green luminescence. In such case the blue band extinguishes in parallel with the green.

131. Variations of Intensity Distribution in Luminescence Spectra of Anthracene and Naphthalene

"Variations of the Intensity Distribution in Luminescence Spectra of Anthracene and Naphthalene," by I. Ya. Kucherov, A. N. Faydysh, and Z. N. Fesenko; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 462-469

The use of anthracene and naphthalene crystals in scintillation counters stimulates interest in their optic properties. Their luminescence spectrum consists of five bands. The intensity distribution of these bands varies widely, depending on the crystalline size, the temperature, and the concentration of impurities. This variation is ascribed to reabsorption. The effect of reabsorption on energy transfer from the basic substance to the impurity is also investigated. It is concluded that the reabsorption of luminescence by the basic substance contributes to the reestablishment of excitons and enhances the energy transfer.

132. Absorption Spectra of Benzene Homologues Analyzed

"Absorption Spectra of Benzene Homologues. III. Absorption of Light by Dialkylbenzenes," by V. L. Broude, Physics Institute, Academy of Sciences Ukrainian SSR, Kiev; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 454-461

Absorption spectra of seven crystals of ortho-, para-, and meta-dialkylbenzenes were analyzed in polarized light at liquid nitrogen temperature. The comparison of results showed that it is possible to excite two mutually perpendicular oscillations in molecules of dialkylbenzenes, as was shown previously in alkyl benzene (see article by author, ibid., 1, 387, 1956). One of the oscillations corresponds to a purely electronic transition and the other to its combination with a not entirely symmetrical oscillation B_1 in ortho-, meta-, and para-dialkylbenzenes.

Such spectral structure is characteristic for benzenes and is considered as a splitting of molecular oscillations of E_{2g} (520 cm^{-1}) benzene, the source of the series.

The presence of spectral absorption bands, polarized in the molecule in mutually perpendicular directions, facilitates, by photometering the absorption spectra in the near ultraviolet, the determining of the orientation of molecules in the investigated cross section.

133. Dispersion and Absorption of Light in Anthracene Crystals at 20.4° K

"Dispersion and Absorption of Light in Anthracene Crystals at 20.4°K," by M. S. Brodin and A. F. Prikhot'ko, Physics Institute, Academy of Sciences Ukrainian SSR, Kiev, Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 448-453

Dispersion and absorption curves of light in anthracene crystals at 20.4°K are plotted for oscillations of the light vector parallel and perpendicular to the monoclinic axis b. Curves of reflexion of crystals under the same conditions are computed. The data obtained are used for finding the oscillating energy of a and b components of the first electron oscillating transition in the crystal: $f_{1b} = 0.12$ and $f_{1a} = 0.05$. By comparing these values with the oscillating energy in the case of anthracene vapor absorption, the oscillating energy of the third component of the crystal spectrum could be evaluated, $f_{1(a,b)} = 0.13$.

Experimental details and a description of the cryostat are included by the authors.

134. Absorption and Emission of Light by Impurity Centers of Isotropic Dielectric

"Absorption and Emission of Light by Impurity Centers," by A. F. Lubchenko, Physics Institute, Academy of Sciences Ukrainian SSR, Kiev; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 439-447

The absorption and emission of light by impurity centers of an isotropic dielectric, having its absorption band distant from the impurity absorption band, are studied. The concentration of the impurity is assumed to be small, and therefore the interaction of the impurity centers may be neglected. In computing the matrix elements of transitions, the nonmultiplicability of the wave function is taken under consideration with a resulting pattern of the impurity emission and absorption bands slightly different from those previously computed (A. S. Davydov, ZhETF, 24, 197, 1953; S. I. Pekar, ZhETF, 22, 641, 1952; A. F. Lubchenko, Ukr. Fiz Zhurn., 1, 265, 1956; ibid., 1, 281, 1956). The possibility of decreasing the intensity of the long-wave edge of the luminescence spectrum and the short-wave edge of the absorption spectrum with lowering of the temperature is indicated.

135. Intermolecular Interaction in Chloroform and Bromoform Solutions

"On Intermolecular Interaction in Chloroform and Bromoform Solutions. II," by V. M. Chulanovskiy and M. P. Burgova; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 433-438

Problems connected with the shift of the absorption band of the CH group in solutions of $CHCl_3$ and $CHBr_3$ in various solvents are analyzed. A theoretical solution is attempted by constructing a simple model. It shows the complex character of the variation of the energy constant of the valency oscillations. Two factors interfere: the weakening of the intramolecular bond and the appearance of a new intermolecular bond. The strong shift to higher frequencies of the CH band in deformation oscillations of the second type of bond and the neligible shift of the first type of bond (see previous article by authors, Opt. i Spekt., 2, 330, 1957) are explained graphically by the appropriate use of models.

136. Effect of solvent on Optical Activity of Molecules in a Solution

"On the Influence of the Solvent on the Optical Activity of Molecules of the Dissolved Substance," by V. M. Agranovich; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 426-432

"Results of previous works (S. I. Pekar, ZhETF, 22, 641, 1952; A. S. Davydov, ZhETF, 24, 197, 1953) are analyzed for a theoretical study of the effect of the solvent on the optical activity of the molecules in the solution. The dispersion of this optical activity and its temperature dependence are discussed.

137. Observation of Anomalous Dispersion in Processes of Brief Duration

"An Arrangement for the Observation of Anomalous Dispersion in Processes of Short Duration," by A. M. Shukhtin and V. S. Yegorov, Scientific Research Institute of Physics, Leningrad State University; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 543-544

The optical equipment of D. S. Rozhdestvenskiy (Anomalnaya Dispersiya [Anomalous Dispersion], published by Academy of Sciences USSR, 1951) for observation of anomalous dispersion requires long exposure due to inadequate light power which lowers the value of the optical system for the study of "wings" of spectral lines. The "wing" method is very useful for studying processes of very short duration, such as wire explosions, pulse discharge, shock wave, and deionization in a gas discharge. To

improve the equipment, a pulse dischares in a low pressure gas tube was used as a source of continuous spectrum. The continuous spectrum was observed in the range of 6500 to 2200 Å, although foreign literature indicates that such a surge also gives a strong infrared emission. Wings were observed near the spectral lines NeI - 6402 A and 6383 Å.

Spectral Analysis

138. Spectral Analysis of Uranium Oxide and Thorium Oxide

"Analysis of Low Volatile Oxides For Halogens," by M. P. Chayka; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 421-425

A method of spectral analysis of uranium oxide and thorium oxide for small impurities of fluorine and chloride is described. The source of light is a gas discharge tube with a hollow cathode. This method detects fluorine in a concentration of 10^{-4}%. The accuracy of the method is about 10%. The equipment and its operation are very simple. The time exposure for uranium oxide is 5-6 minutes, and for thorium oxide, 8-9 minutes.

139. Methods of Measuring Temperature of Spark Discharge Analyzed

"Temperature Distribution in the Plasma of Low-Voltage and High-Voltage Discharges," by D. B. Gurevich and V. K. Prokof'yev; Leningrad, Optika i Spektroskopiya, Vol 2, No 4, Apr 57, pp 417-420

Methods of measuring the temperature of a spark discharge were analyzed. A correct temperature evaluation of plasma discharge requires a good resolution in time of the separate glowing zones. The author, as well as H. Huldt (Sp. Acta, 7, 264, 1955) drew attention to the fact that spectroscopically measured temperature varies depending on what spectral line is chosen. It also was found that different zones of the flares possess different temperatures, even at the same instant. This work was submitted to the editors on 6 September 1956.

140. Superconductivity

"The Application of the Variational Principle to the Theory of Superconductivity," by I. A. Kvasnikov; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 4, 1 Mar 58, pp 675-677

Further development is presented of a previous study by the author (DAN, 119, No 3, 1958) in which the variational principle was applied to research on thermodynamic properties of a superconducting system by the new method of N. N. Bogolyubov (ZhETF, 34, No 1, 1958). The results obtained gave a good expression of the asymptotically accurate (at V→∞, N→∞, N/v = constant) solution of the specified problem. The variational principle is applied to a system with a Hamiltonian of a more general type than that used in the computation by N. N. Bogolyubov, D. N. Zubarev, and Yu. A. Yserkovnikov (DAN, 117, No 5, 1957).

141. East German Treatise on Magnetohydrodynamics

"Observations on the Hydromagnetic Theory of Plasma" and "Hydromagnetic Waves," by Heinz Kautzleben, Deutsche Akademie der Wissenschaften zu Berlin, Geomagnetisches Institute Potsdam, Abhandlung [Treatise] Nr 20, Berlin, 1958, 127 pp

In the preface, Prof G. Fanselau, Karl Marx University, Leipzig, says that the two articles grew out of a thesis work under his direction; publication was considered advisable, because the results of Kautzleben's research went beyond the scope of a thesis, in importance, and especially since Kautzleben discovered a number of erroneous conclusions and inadequacies in the current literature on the subject. The texts of the author's conclusions follow:

 The following is the text of the author's conclusions to "Observation on the Hydromagnetic Theory of Plasma":

"This work attempts to present the fundamental principles of a hydromagnetic theory. The point of departure is the view that such a theory must be based on the results of individual areas -- the electrodynamics of a continuum in motion and the plasma theory. The essential results are given below:

"1. Hydromagnetics [magnetohydrodynamics] is understood as a macroscopic-phenomenologic theory of the phenomena and processes produced by the combined effect of mechanical and electromagnetic forces in a plasma which is influenced by an external magnetic field. In such a case, the plasma is said to be continuously distributed in space. The occurrence of electrically charged particles is described solely by the material property, 'electrical conductivity.' Materially intrinsic internal effects which disturb the character of the continuum are excluded.

"Hydromagnetic processes are combinations of hydrodynamic motion and change of electromagnetic field. The motion is influenced electromagnetically; the field is changed by the motion. Hydromagnetics is therefore an extension of hydrodynamics by ponderomotor forces of electromagnetic origin and a carrying over of electrodynamics to continua in motion.

"2. The Maxwell theory, which applies only for the inertial system in which the body is at rest, does not apply in the electrodynamics of bodies in motion. Minkowski has given an extension of the phenomenological observations of Maxwell to bodies in motion. The connection between

the four field variables -- electrical field strength, induction, displacement, magnetic field strength -- is expressed by four field equations which are invariant with respect to the Lorentz transformation, and therefore have the same form in the system in which the body is at rest and in the system of the observer. The reduction to two field variables is provided in the system at rest by the Maxwell material equations, in the system of the observer by the Minkowski equations; they are only the same when the material constants of the vacuum apply.

"3. In all macroscopic problems only those velocities occur which are very small in relation to the velocity of light in a vacuum. The theory thus remains within the nonrelativistic boundary. The motion of the plasma continuum may, at most, be quasistationary. This follows from the discussion of the Minkowski theory. The system in which the body is at rest moves with the observed volume element toward the system of the observer. Strictly speaking, this motion must be translational. By approximation, one additional quasistationary type of motion is permitted. Thus only motions of the plasma may be taken into account, which are slowly variable in respect to space and time.

"4. The problem of the ponderomotor forces of the electromagnetic field in matter has not yet been solved. The equation of force for stationary fields is sufficient for the limitations given here.

"5. Plasma is characterized by the occurrence of essentially different components. The theoretical treatment is very much influenced by this. The laws of statistical mechanics cannot be carried over directly to plasma, because of the extensive and relatively strong Coulomb forces. In a gas-kinetic sense, there is no such thing as a collision, but only an electrostatic influence by widely separated partners. A collision between charged particles is the sum of many small deflections.

"6. Statistical mechanics generally fails because of the excessive mathematical difficulties. In certain rare cases, a macroscopic theory with its relatively great simplicity is possible. It can be applied only when strong effects are lacking on paths which are short in comparison with the average mean path.

"The simplest phenomenological theory of the plasma, which includes the above-mentioned property, is the plasma dynamics of Schleuter and others. This is a hydromechanics of several mutually penetrating continua; the electromagnetic variables are connected by means of the equations of the electron theory.

"The ordinary magnetoionic theory represents the limiting case of plasma dynamics, if we consider, within an immovable continuum in the presence of a primary magnetic field, the motion of an electron gas of such low density that the gas pressure within this electron continuum can be neglected.

"7. A phenomenological theory of a simple plasma continuum in an external magnetic field can be presented only with considerable limitations. It would require that the densities of the charged and uncharged particles be great, that the magnetic field, on the other hand, be weak, and that the change of motion take place slowly. The reduction of the various continua to a single continuum is possible only within the limits of linearized problems, whether the individual components are considered equal, or whether the neutral gas is preferred. Materially intrinsic internal effects, which cannot be described in accordance with a hydromagnetic theory, occur in the case of nonlinear disturbances.

"Displacement current is, by nature, foreign to hydromagnetics. It occurs when the changes of motion take place so rapidly that the motion of the heavy particles becomes negligible. Problems in which the displacement current is to be taken into account involve a separation of the uniform continuum, which is by no means acceptable.

"Hydrodynamic equations can be combined only when, firstly, the acceleration of the diffusion currents relative to the center of gravity and, secondly, a charge separation through motion effects are excluded. According to research by Larenz, a separation of charge can occur in completely ionized gases in the case of processes which propagate faster than the ionic noise.

"8. From the individual impulse balances of plasma dynamics, a relationship can be derived for the conductivity of a weakly ionized gas in which the conductivity tensor is represented in the same form as in ordinary statistical theory. This tensor applies only for quasistatic problems in which the energy exchange, in the case of collisions with the neutral particles, is of the same order of magnitude for all charged components.

"The character of the conductivity is influenced by three parameters: the density of the plasma (described by the various collision frequencies), the intensity of the external magnetic field (described by the Lamor frequency), and the character of the motion (described by the wave frequency). The macroscopic parameters of the conductivity can be applied only when the density is relatively great: the wave frequency must be very small in comparison with all collision frequencies. In the general case, the conductivity of the hydromagnetic continuum is a tensor. When the magnetic field is weak (the Lamor frequencies very small in comparison with the collision frequencies), an isotropic conductivity can be used.

"9. These requirements limit the area of application to a very few problems. The following either cannot be treated or can be treated only with considerable limitations:

"a. All problems in which the displacement current is materially intrinsic, for example, the propagation of radio waves in ionized gases.

"b. All problems in which the motion can no longer be considered quasistationary. This is the case with all rapid oscillations and waves.

"c. All problems in which a charge separation takes place as a result of the motion. This includes all phenomena with velocities which are essentially greater than the usual sonic velocity in plasma. In the broadest sense, the compressible plasma can be treated only within limitations (requirements b and c, above, do not apply independently).

"d. All problems in which the nonlinear terms are essential. This includes, for example, the hydromagnetic dynamo theory and the problem of hydromagnetic shock waves.

"The preceding work represents only a first attempt to combine the results of various fields of activity in a purely macroscopic theory of the magnetic field. This necessary step has been given very little attention in earlier investigations of hydromagnetic problems. This work, then, does not claim to even mention all the problems.

"It is my very pleasant duty to thank Prof Dr G. Fanselau for suggesting this study and for his willing support at all times. I am also very grateful for the valuable discussions with and suggestions from Dr O. Lucke."

The text of the author's conclusions to "Hydromagnetic Waves" follows.

"Hydromagnetic waves are wave disturbances with such small amplitudes that a calculation of interference, such as is used in acoustics, is possible. They represent practically the only problem in which all the requirements, which must be proposed in the application of the hydromagnetic approach, are satisfied.

"Waves can propagate in a hydromagnetic continuum because it possesses stability of configuration. The medium as a whole provides the inertia; the restoring force is produced by a combination of gas pressure and electromagnetic forces. The possibility of the propagation of compression and dilatation waves is present. Through the so-called 'freezing of the lines of force,' the magnetic field gives the plasma a sort of transverse rigidity, which affords an additional possibility of oscillation. The result of this is a new type of motion, the Alfven wave. This is a transverse hydromagnetic wave, the velocity of which is determined by the intensity of the external magnetic field, the density, and the direction of propagation. Its greatest velocity is in the direction parallel to the external field; normal to the field, the velocity is zero.

"The hydromagnetic continuum is triply refractive. Two Alfven waves and one sound wave occur, which, in the general case, are coupled with one another. They always propagate in a positive and negative direction. Hydromagnetic waves are periodic motions. There are also aperiodic forms of motion which are produced by the attenuation.

"An uncoupling of the waves, and the appearance of the individual wave types independently, are possible only under certain conditions:

"a. Separation in the case of preferred propagation directions: In the case of a propagation parallel to the external magnetic field, the two Alfven waves appear separately. The sound wave is not influenced by the magnetic field. The sound wave, which is extensively influenced by the magnetic wave, coupled with a strongly damped wave, propagates perpendicular to the magnetic field.

"b. Uncoupling in the case of varying type of conductivity: The three waves occur coupled in the anisotropically conducting hydromagnetic continuum. In the case of isotropic conductivity, the sound wave and one Alfven wave occur coupled; the second Alfven wave occurs independently.

"c. Limitation through kinematic conditions: The compressible plasma is the usual case. In the incompressible case only one Alfven wave is possible, because of the transverse rigidity produced by the magnetic field.

"Undamped hydromagnetic waves occur only in a plasma with no mechanical friction and infinitely great conductivity. Mechanical and magnetic viscosity is produced by attenuation effects which are very similar to one another.

"The characteristic property of hydromagnetics is the coupling of hydrodynamics and electrodynamics. This hydromagnetic coupling is conditioned by the ratio of the ponderomotor force of the electromagnetic field to all other forces (pressure gradient plus external mechanical forces). If the ratio is great, a strong coupling takes place; this is the area of hydromagnetics. If the ratio is small, a separation of hydrodynamics and electrodynamics takes place. In the case of weak coupling, hydromagnetic resonance takes place. This occurs when hydrodynamic oscillations excite natural oscillations of the electromagnetic system.

"If an understanding of the mechanism of these new waveforms and the method common to all development stages of the theory for the unbounded medium has been provided, the purpose of this work has been fulfilled. With regard to the possibility of application in the plasma theory of the ionosphere, the theory of hydromagnetic resonance in a bounded medium must be expanded."

Miscellaneous

142. Physicists Meet in Leipzig

"Physicists From 12 Countries in Leipzig" (unsigned article); Berlin, Vorwaerts, 28 Apr 58, p 2

On 27 April 1958, more than 400 physicists and scientists from East Germany and other countries attended the annual meeting and theoreticians conference of the East German Physics Society in the new Physics Institute of the Karl Marx University in Leipzig. Among those present from East Germany were Prof Dr Gustav Hertz, director of the Physics Institute; Prof Dr of Engineering Barwich; Prof Dr Thiessen, chairman of the East German Research Council; and Professors Rompe, Havemann, von Ardenne, and Goerlich. State Secretary Dr Girnus and Prof Dr Mayer, rector of the Karl Marx University, were also present at the opening of the conference.

Also taking part in the 4-day conference was a Soviet delegation under the leadership of Professor Bogolyubov, and physicists from Czechoslovakia, Poland, Bulgaria, Hungary, Rumania, China, France, and Great Britain. Also present were Frau Prof Lise Meitner, long-time assistant to Max Planck, Prof Dr Heisenberg and Max von Laue, and others from West Germany. Prof Dr Heisenberg spoke on advances in the theory of elementary particles (Elementarteilchen), after which speeches were heard by Professors Migdal and Ivanenko of the USSR and Prof J. P. Vigier of Paris. Prof Dr Robert Havemann spoke "On an Interpretation of Quantum Mechanics (Quantenmechanik)."

143. Czechoslovak Atomic Scientists Travel to Soviet Union

"Czechoslovak Atomic Scientists to the Soviet Union" (unsigned article); Prague, Obrana Lidu, 20 May 58, p 1

On 19 May 1958, Vaclav Petrzilka, Corresponding Member of the Czechoslovak Academy of Sciences (Ceskoslovenska akademie ved), and Engr Cestmir Simane, director of the Institute of Nuclear Physics (Ustav jaderne fysiky) of the Czechoslovak Academy of Sciences, left to attend the meeting of the Scientific Council of the Joint Institute for Nuclear Research in Dubna near Moscow. The meeting was to be held from 21 to 25 May.

144. Determination of Moisture Content of Materials by Gammascopy

"Determination of Moisture Content of Materials by the Gammascopy Method," by L. G. Polozova, Candidate of Geographic Sciences, and R. P. Reyzman, Candidate of Technical Sciences; Tallin, Izvestiya Akademii Nauk Estonskoy SSR, No 2, 1957, pp 122-130

A fairly reliable method was developed for the rapid determination of the moisture content of samples of structural materials. By means of this method, variations in moisture content of a sample can be determined without interrupting the experiment or destroying the sample. This method should considerably facilitate the study of the laws of movement of moisture in solid bodies.

145. Czechoslovak Atomic Energy Research and Application

"The Atomic Age and New Roads of Research" (unsigned article); Bratislava, Lud, 11 Apr 58, p 3

The atomic electric power plant which is to be started in 1958 in Slovakia and whose electric power output will reach 150 kilowatts will be the largest in Europe. The plant will be gas-cooled and will use heavy water as the moderator.

A workers collective from the UJF (Ustav jaderne fysiky, Institute of Nuclear Physics) has been working for some time on research connected with the establishment of a large plant working with heavy water. Some problems must still be solved, such as the manufacture of immense pressure vessels which will contain the atomic reactor, preparation of atomic fuel and its processing after the frequent "burning up" in the reactor, the problems of the regulation of atomic reaction, and the behavior of new types of materials under intense radiation and heat in the reactor, such as graphite, heavy water, uranium, alloy steels, and specialized metal alloys.

It is predicted that in 1965 about 2 billion kilowatt-hours will be produced per year by atomic electric power plants in Slovakia and Moravia. An original, automatic "gammagraph," designed by the Institute of Oncology (Onkologicky ustav) in Bratislava, and P 32 (radioactive phosphorous), used in the treatment of leukemia and "polycytemie" [presumably polycythemia], are some examples of the use of radioisotopes. The "gammagraph" automatically registers the activity of various parts of the thyroid gland.

Radioisotopes of cobalt and iridium have been used in the inspection of castings and welds for some time in large engineering plants. Turbine walls up to 20 centimeters thick have been examined in such a manner. Tagged atoms are used in water research activities, and radioisotopes are also used in agriculture.

IX. MISCELLANEOUS

146. Soviet Handling of Secret Inventions, Discoveries, and Rationalizers Suggestions

"Secret Inventions, Discoveries, and Rationalizers Suggestions" (unsigned article); Leningrad, Izobretatel'stvo SSSR, No 12, Dec 57, pp 23-24

"Those inventions, discoveries, and rationalizer's suggestions which concern the defense of the state are classified secret.

"The Committee for Inventions and Discoveries under the Council of Ministers USSR and all other organs which handled inventions, discoveries and rationalizer's suggestions can classify them secret if this is considered to be in the best interests of the state.

"When the decision is made to classify an invention, discovery, or a rationalizer's suggestion secret, the author or responsible organization is immediately notified. Declassification, on the other hand, would be handled in the same manner.

"The publication of material on any invention, discovery, or rationalizer's suggestion, which is classified secret or the dissemination of their essence by any means would constitute a criminal act subject to prosecution.

"When an author believes that his suggestion may have a secret nature, he is obligated to take all necessary precautions against improper dissemination and is required to hand over the suggestion to the interested state organ of the USSR.

"To develop secret inventions, discoveries, or rationalizer's suggestions, the interested enterprise is required to furnish for the authors a special billet, and to prevent them from working on their inventions, etc., at home.

"Declarations on secret inventions, with the exception of top secret inventions of defense significance, are accepted and examined by the Committee for inventions and Discoveries under the Council of Ministers USSR, which can receive these declarations through the secret organs of any enterprise, establishment, or department.

"Declarations on top secret inventions pertaining to new methods of armament and combat techniques and their tactical use are accepted and examined by the Ministry of Defense USSR, which also examines complaints of inventors on problems of author's certificates of a given invention, the utilization of a given invention, and the granting of compensation for the invention.

"The registration of the given invention and the granting of the author's certificate are conducted by the Committee for Inventions and Discoveries under the Council of Ministers USSR on its presentation by the Ministry of Defense USSR."

147. Committee on Inventions and Discoveries Under the Council of Ministers USSR and its Relationship to Academy of Sciences USSR

"The Registration of Scientific Research Work by the Institutes of the Academy of Sciences USSR" (unsigned article); Leningrad, Izobretatel'stvo SSSR, No 6, Jun 57, p 34

The Committee on Inventions and Discoveries under the Council of Ministers USSR has investigated the status of the preparation for presentation for registration of scientific work done by the following institutes of the Academy of Sciences USSR: Institute of Semiconductors, Marine Hydrophysics Institute, Leningrad Physicotechnical Institute, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Institute of Physical Chemistry, Geological Institute, Institute of Biochemistry imeni A. N. Bakh, Institute of Automatics and Telemechanics, Institute of Radio Engineering and Electronics, the Power Engineering Institute imeni S. M. Krzhizhanovskiy, and the Physics Institute imeni P. N. Lebedev.

The committee pointed out that the Presidium of the Academy of Sciences USSR did not take proper measures in the timely presentation for registration of completed scientific research work of scientific establishments of the academy. Only 104 projects were presented for registration by 15 March 1957. The greatest majority of the scientific establishments of the academy only recently began to prepare work for presentation for registration.

The scientific establishments of the Academy of Sciences USSR, contrary to the existing laws on registration of work, have directed material on completed scientific research, due for registration, directly to the All-Union Institute of Scientific and Technical Information for publication, and published the material, before registration, in the periodicals of the Academy of Sciences USSR.

These shortcomings are the responsibilities of the various departments of the Academy of Sciences USSR.

V. A. Fillipova, representative of the Presidium of the Academy of Sciences USSR, has informed the Committee for Inventions and Discoveries that to eliminate shortcomings in the registration of completed scientific research work, the Presidium of the Academy of Sciences USSR has instigated the following measures:

1. The presidium has issued a special directive to the departments of the Academy of Sciences USSR on expediting the presentation for registration of completed scientific work.

2. The presidium has informed all heads of scientific establishments of the necessity for a radical improvement in protecting the state's and author's rights through the timely presentation for registration of completed scientific research work and notifications on inventions and discoveries done as a result of the completion of this research work.

3. The presidium will analyze, during its sessions and sessions of the bureau of the academy's departments, problems concerned with improving the presentation for registration of scientific research work, and will take necessary measures which will guarantee the presentation to the committee of all relevant registrations of scientific research work completed by scientific establishments in 1955-1956.

The Committee for Inventions and Discoveries has published the following recommendations for the Academy of Sciences USSR:

1. Reports are to be presented at all meetings of the Presidium of the Academy of Sciences USSR, from the departments of the academy on the presentation by scientific establishments of the registration of the completed work in 1955-1956 and on measures for the guarantee of a timely presentation for registration of work which will be completed in 1957.

2. A member of the Presidium of the Academy of Sciences USSR is to be selected to coordinate the work of presenting for registration completed research.

The committee together with the Presidium of the Academy of Sciences USSR has decided to determine the more important scientific work completed by scientific establishments of the academy and to analyze them in the committee with the aim of taking necessary measures for the expeditious introduction of these works into the national economy.

148. USSR Participation in Work of UNICEF

"Aid to Children in Underdeveloped Countries" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 43, 30 May 58, p 4

The USSR contributes 2 million rubles yearly into the UNICEF fund. In addition, 300,000 rubles was contributed in 1958 by the Ukrainian SSR and 150,000 rubles by the Belorussian SSR. The USSR maintains a close tie with the administration of UNICEF through the Executive Committee of the Red Cross and Red Crescent of the USSR, and through N. I. Chikalenko, its presidium member.

149. Academy of Sciences Kazakh SSR Forms an Affiliate

"New Scientific Center in Western Kazakhstan" (unsigned article); Alma-Ata, Kazakhstanskaya Pravda, No 75, 30 Mar 58, p 4

By decision of the Coordinating Council of the Academy of Sciences USSR, a West-Kazakhstan Affiliate (Zapadno-Kazakhstanskiy Filial) of the Academy of Sciences Kazakh SSR has been formed. The affiliate is located in Gur'yev, Gur'yevskaya Oblast, and will consist of four scientific research institutes and three sectors. The four institutes are the Mining-Geological (Gorno-Geologicheskiy) Institute, the Institute of Petroleum (Nefti), the Institute of Chemistry and Mineral Salts (Khimii i Mineral'nykh Soley), and the Institute of Ichthyology and Hydrobiology (Ikhtiologii i Gidrobiologii). The three sectors are the Sector of Power Engineering (Sektor Energetiki), Sector of Construction and Construction Materials (Sektor Stroitel'stva i Stroitel'nykh Materialov), and Sector of Economics (Sektor Ekonomiki).

150. Prospective Plan for Scientific Research of Academy of Sciences Ukrainian SSR

"Ukrainian Scholars Discuss the Prospective Plan of Scientific Research" (unsigned article); Kiev, Pravda Ukrainy, No 92, 28 Apr 58, p 3

Delegates at the 2-day general meeting of the Academy of Sciences Ukrainian SSR discussed the results of the work of the academy for 1957 and the outlook for the scientific research of its institutes, laboratories, and observatories for the coming years.

The report of Academician A. V. Palladin, president of the Academy of Sciences Ukrainian SSR, concerned the plan for the development of scientific research of the Academy of Sciences Ukrainian SSR for 1959-1965. The report discussed nearly 90 basic problems in the fields of technology, physicomathematics, chemistry, geology, biology, and social sciences.

In the field of physicomathematical sciences, Ukrainian scholars are scheduled to conduct major research in the problems of theoretical physics, nuclear spectroscopy, atomic energy, radiophysics and electronics, radioastronomy, physics of low temperatures, physics of semiconductors and cathode electronics, and physics of supersonics. Research on nuclear physics will be considerably broadened on the basis of the atomic reactor and special laboratories which are being constructed and should be completed by 1959.

A wide range of research is planned in the field of chemistry. The principal channel or research will be in the development of the natural raw resources of the Ukraine, and the obtaining of useful materials for the preparation of plastics, synthetic fibers and rubber, paints, and other materials. Several new laboratories are to be organized in order to do this work. Research is also to be undertaken in the development of special chemical compounds for insect control, the chemical refining of petroleum, the purification of drinking water, and the development of new anticorrosive substances.

In the field of geology, research will be channeled toward broadening the knowledge of the natural resources and mineral wealth of the Ukraine and the enlargement of the natural resource bases for various branches of the national economy. Research will also be conducted in the prospecting for and establishing of new nonferrous, rare, and scarce metals and elements and new coal deposits in the region of the Upper Donbass, the L'vivsko-Volynskiy Basin, and others.

The development of biological sciences, as discussed at the general meeting, will revolve around improvement in the fields of animal husbandry, plant cultivation, and medicine. In particular, research will be conducted on such important problems as "Protein, the Carrier of Life," "Basic Laws of the Biological Action of Nuclear Radiation," "Photosynthesis, Nutrition, and Growth of Plants as the Theoretical Basis of Cultivation," "The Basic Problems of the Development and Life Action of Man," and "The Biochemistry of the Nervous System."

The plan for scientific research in the field of technology will include the study of the methods for increasing production 100-200 percent within the next 15 years. Also studied will be the formation of the scientific basis of the automatization of production processes, the designing of highly effective gas turbines, and the future perfection of welding.

Likewise, important strides will be undertaken, according to the plan, in the field of social sciences, especially in archaeology, economy, history, philosophy, and literature.

The following members of the academy gave reports at the general meeting; I. Z. Shtokalo, Active Member of the Academy of Sciences Ukrainian SSR; V. M. Glushkov, Doctor of Physicomathematical Sciences, member of the newly organized Computer Center of the academy; K. A. Kornev, Doctor of Chemical Sciences, head of the Laboratory of High Molecular Compounds (newly organized laboratory within the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR); I. G. Pidoplichko, Doctor of Biological Sciences; K. I. Titomir, Corresponding Member of the Academy of Sciences Ukrainian SSR and deputy director of the Institute of Mining, Academy of Sciences Ukrainian SSR; V. Ya. Klimenko, Candidate of Geologico-mineralogical Sciences; N. P. Semenenko, vice-president and Active Member of the Academy of Sciences Ukrainian SSR; P. N. Pershin, Active Member of the Academy of Sciences Ukrainian SSR; R. Ye. Kavetskiy, Active Member of the Academy of Sciences Ukrainian SSR; D. F. Ostryanin, Corresponding Member of the Academy of Sciences Ukrainian SSR; N. P. Barabashov, Active Member of the Academy of Sciences Ukrainian SSR; M. F. Ryl'skiy, Active Member of the Academy of Sciences Ukrainian SSR; Ye. A. Shilov, Active Member of the Academy of Sciences Ukrainian SSR; K. K. Khrenov, Active Member of the Academy of Sciences Ukrainian SSR; V. Ye. Lashkarev, Active Member of the Academy of Sciences Ukrainian SSR; Yu. K. Delimarskiy Active Member of the Academy of Sciences Ukrainian SSR; S. I. Tetel'baum, Corresponding Member of the Academy of Sciences Ukrainian SSR; and I. N. Frantsevich, Corresponding Member of the Academy of Sciences Ukrainian SSR.

151. Uzbek Academy of Agricultural Sciences Organized

"Uzbek Academy of Agricultural Sciences" (unsigned article); Moscow, Vestnik Sel'skokhozyaystvennoy Nauki, No 10, Oct 57, pp 154-155

Within the framework of the newly organized Uzbek Academy of Agricultural Sciences are included all the major scientific research institutes of the republic which are concerned with research on cotton growing, mechanization and electrification, irrigation, animal husbandry, karakul production, and veterinary medicine, experimental stations, and the Tashkent Agricultural Institute. The new academy will be the center of agricultural studies in the Uzbek SSR.

The following have been named Active Members of the academy: K. Z. Zakirov, Doctor of Biological Sciences A. D. Dadabayev, Doctor of Biological Sciences; M. Karimov, Doctor of Biological Sciences; S. N. Ryzhov, Doctor of Agricultural Sciences; V. Ye. Yeremenko; A. A. Rakhimov, Candidate of Agricultural Sciences; N. M. Mannanov; and M. V. Mukhamedzhanov. The following have been named Corresponding Members of the academy: G. A. Koshevnikov, Doctor of Technical Sciences; M. M. Mirzayev, Candidate of Agricultural Sciences; M. T. Tadzhiyeva, Candidate of Agricultural Sciences; Ye. M. Yershova, Candidate of Agricultural Sciences; F. I. Uchevatkin, Candidate of Agricultural Sciences; D. K. Saidov, Candidate of Biological Sciences; F. N. Nadzhimov, Candidate of Technical Sciences; and G. N. Gavrilov.

K. Z. Zakirov was elected president of the academy, S. N. Ryzhov and A. D. Dadabayev vice-presidents, and A. A. Rakhimov chief scientific secretary. The following were elected to the presidium of the academy: A. D. Dadabayev, V. Ye. Yeremenko, K. Z. Zakirov, N. M. Mannanov, M. V. Mukhamedzhanov, A. A. Rakhomov, and S. N. Ryzhov.

152. Foreign Members of Academy of Sciences USSR

"Foreign Scholars Are Members of Academy of Sciences USSR" (unsigned article); Moscow, Nauka i Zhizn, No 5, May 58, p 73

The following foreign scholars are members of the Academy of Sciences USSR: Zdenek Nejedly, president, Czechoslovak Academy of Sciences, Corresponding Member of the Academy of Sciences USSR; Todor Pavlov, president, Bulgarian Academy of Sciences, Corresponding Member of the Academy of Sciences USSR: Stefan Mladenov, Active Member, Bulgarian Academy of Sciences, Corresponding Member of the Academy of Sciences USSR; Kazimierz Nitsch, Active Member, Polish Academy of Sciences, professor of Slavic Philology, Corresponding Member of the Academy of Sciences USSR; and Max Fasmer, East German linguist, Corresponding Member of the Academy of Sciences USSR.

153. Foreign Biological and Medical Specialists Elected Members of Academy of Sciences USSR

"Elections in Academy of Sciences USSR" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 50, 24 Jun 58, p 3

In line with the expansion of international ties, the Academy of Sciences USSR has considerably increased the number of its foreign members. Thirty-two new members from foreign countries have been elected to the academy. Among them are the following biological and medical specialists:

Karl Sigban, Swedish chemist, noted for his work on roentgenoscopy.

Sir Cyril Norman Hinshellwood, English physicochemist, noted for his work on the chemical kinetics of bacterial cells.

Frantisek Sorm, vice-president of the Czechoslovak Academy of Sciences, noted for his work in biochemistry.

Marcel Zenon Bacq, professor of therapeutic pathology, Medical Faculty, Liege University, noted for his work in physiology, pharmacology, and radiobiology, and neural disorders.

Detlev Wulf Bronk, American neurologist, noted for his work on electrophysiology of the nervous system.

Yan Debowski, Polish biologist.

Wilder Graves Penfield, Canadian neurosurgeon, noted for his work on the human brain cells.

Kay Ulrich Linderstrem-Lang, Danish biochemist, noted for his work on proteins.

Istvan Rusnyak, president, Hungarian Academy of Sciences, noted for his work on the biochemistry of vitamins and pathogenesis of diseases of the kidneys.

Traian Savulescu, Rumanian, botanist, microbiologist, and phytopathologist, president of the Rumanian Academy of Sciences.

154. East German-USSR Technical and Scientific Exchange Commission Meets

"Technical Exchange Between USSR and GDR Expanded" (unsigned article); Berlin, Neues Deutschland, 20 May 58, p 5

The seventh session of the Soviet-[East] German Commission for Technical-Scientific Cooperation between the USSR and the GDR was concluded with the signing of a communique. The communique emphasizes the fact that cooperation between the two countries is increasing each year. Increasing numbers of specialist delegations are furthering the mutual gathering of information concerning production processes and new discoveries in various branches of industry and the transmission of technical data and production samples. The commission agreed on measures which are designed to expand and increase this cooperation.

155. Czechoslovak Scientists Honored

"Awarding of 'Klement Gottwald' State Prizes" (unsigned article); Prague, Obrana Lidu, 8 May 58, p 1

Czechoslovak president Antonin Novotny, has announced that the "Klement Gottwald" State Prizes have been awarded to a group of workers in albumen research at the Chemical Institute (Chemicky ustav) of the Czechoslovak Academy of Sciences (Ceskoslovenska akademie ved), which was led by Academician Frantisek Sorm and Engr Dr Borivoj Keil, for outstanding scientific work in the field of albumen microstructure; to Docent Dr Engr Ctibor Blattny for scientific work in the field of viroses of economically important plants and other plants and to Engr Jiri Korbl for working out an original method of elementary analysis of organic compounds.

156. Death of East German Scientist Reported

"Prof Dr Eggebrecht Died" (unsigned article); Halle, Der Neue Weg, 12 Mar 58

Prof Dr Heinrich Eggebrecht, director of the Institute for Seed Testing and Seed Research of the Friedrich Schiller University in Jena, died recently in Halle at the age of 60. Since 1948 he had also worked as department chief of the Research Institute for Experimental Agriculture in Jena.

157. Ledebur Prize Competition Awards

"Ledebur Prize Competitions of the Society of German Miners and Metallurgists"; Berlin, Giessereitechnik, No 2, Feb 58, inside back cover

The Ledebur Prize was awarded for the first time at the annual Main Assembly of the Society of German Miners and Metallurgists on 14 November 1957. Prof Dr Engr O. Oelsner, chairman of the society, awarded the prize to Graduate Engineer J. Loehn of Freiberg, for his paper titled "The Separation of Zinc Particles (Zinckies) From Ores in Bezirk Freiberg," and to Graduate Engineer J. Schleier of Freiberg, for his "Paper on Improving the Renn Process." Both papers will be published in the periodical Neue Huette. The article also presents the regulations for competing for this prize in 1958.

158. New Hungarian Doctors and Candidates of Science in 1957

"Report of the Scientific Qualifying Committee (unsigned article); Budapest, Magyar Tudomany, No 7-10, 1957, pp 338-341, 428-430

The Scientific Qualifying Committee has awarded the degree of doctor or candidate of science to the following persons:

Janos Acsel, Doctor of Mathematics, for his dissertation, "The Theory of Geometric Objects." His opponents were Gyorgy Hajos and Alfred Renyi, Academicians, and Otto Varga, Corresponding Member of the Academy of Sciences.

Janos Hollo, Doctor of Chemistry, for his dissertation, "Some Theoretical and Industrial Applications of Quaternary Vapor-Liquid Systems in Equilibrium." His opponents were Geza Schay, Academician , and Arpad Gerecs and Janos Proszt, Corresponding Members of the academy. Denes Bachrach, Candidate of Medicine, for his dissertation, "The Main Problems of Hypothalamic Neurosecretion." His opponents were Janos Szentagothai, Corresponding Member of the academy, and Karoly Farkas, Doctor of Medicine.

Jozsef Becze, Candidate of Veterinary Medicine, for his dissertation, "Investigation of the Sexual Function of Hybrid Species in Mules." His opponents were Istvan Meszaros and Andor Szepeshelyi, Candidates of Veterinary Medicine.

Gyorgy Csaba, Candidate of Medicine, for his dissertation, "Data on the Biology of Heterotransplants." His opponents were Zoltan Alfoldy and Pongrac Endes, Candidates of Medicine.

Sandor Dan, Candidate of Medicine, for his dissertation, "Theoretical and Practical Problems in the Functional Diagnosis of the Liver." His opponents were Jozsef Sos, Doctor of Medicine, and Antal Fischer, Candidate of Medicine.

Lajos Daniel, Candidate of Biology, for his dissertation," Investigation of the Biology of Pollen in Artificial Cultivation." His opponents were Aladar Porpaczy, Corresponding Member of the academy, and Sandor Sarkany, Doctor of Biology.

Egon Gaal, Candidate of Engineering, for his dissertation, "Microwave Ribbon Lines." His opponents were Edvin Istvanffy, Doctor of Engineering, and Tibor Hoffman, Doctor of Physics.

Matyas Gerbner, Candidate of Medicine, for his dissertation, "The Connections Between Higher Nervous Activity and Kidney Function." His opponents were Mihaly Foldi, Doctor of Medicine, and Gyorgy Adam, Candidate of Medicine.

Janos Guoth, Candidate of Veterinary Medicine, for his dissertation, "The Conditioning of the Thyroid Gland." His opponents were Janos Mocsy, Academician, and Armand Kemeny, Candidate of Veterinary Medicine.

Andras Hajnal, Candidate of Mathematics, for his dissertation, "Investigations in the Sphere of the Axiomatic Agglomeration Theory." His opponents were Peter Rozsa and Janos Suranyi, Doctors of Mathematics.

Mihaly Horanyi, Candidate of Medicine, for his dissertation,""Study of Blood Coagulation in Natural Plasma." His opponents were Endre Jeney, Doctor of Medicine, and Mihaly Gerendas, Candidate of Biology.

Bela Janko, Candidate of Biology, for his dissertation, "Investigation of Leaf Morphogenetics." His opponents were Sandor Sarkany, Doctor of Biology and Mihaly Maroti, Candidate of Biology.

Jeno Jaray, Candidate of Engineering, for his dissertation, "The Relation Between the Granular Structure and the Physical Characteristics of Soils." His opponents were Frigyes Kovacshazy and Arpad Kezdi, Candidates of Engineering.

Tibor Javor, Candidate of Medicine, for his dissertation, "Investigations of the Pathology of the Stomach." His opponents were Jozsef Sos, Doctor of Medicine, and Bela Fornet, Candidate of Medicine.

Janos Katona, Candidate of Engineering, for his dissertation, "Electrolytic Condensers." His opponents were Erno Winter, Academician, and Edvin Istvanffy, Doctor of Engineering.

Jeno Kertesz, Candidate of Medicine, for his dissertation, "New Results in the Use of Prosthetics in Cases of Bone Deficiency of the Face or Jaw." His opponents were Laszlo Molnar and Istvan Varga, Candidates of Medicine.

Bela Kozma, Candidate of Physics, for his dissertation, "Prediction of Surface Air Currents." His opponents were Laszlo Egyed, Doctor of Geology and Mineralogy, and Bela Bell, Candidate of Physics.

Sandor Lang, Candidate of Medicine, for his dissertation, "Role of the Factors Governing the Regeneration of the ATP Content of Muscle." His opponents were Mrs Ilona Balo, Doctor of Medicine, and Mrs Vilmos Szekessy, Candidate of Medicine.

Dezso Lazar, Candidate of Medicine, for his dissertation. "Experiences in Plastic Surgery of the Antethoracic Esophagus." His opponents were Bela Molnar and Pal Rubanyi, Candidates of Medicine.

Istvan Magyarosy, Candidate of Chemistry, for his dissertation, "Processing of Calcium-Aluminate Slags in the Alumina Industry." His opponents were Bela Lanyi, Doctor of Chemistry, and Jozsef Talaber, Candidate of Chemistry.

Janos Major, Candidate of Medicine, for his dissertation, "Reoperation of Astrocytomas of the Cerebellum in Childhood," which was defended in the USSR.

Gyorgy Ocskay, Candidate of Chemistry, for his dissertation, "Investigations of the Furylketoximes Group." His opponents were Arpad Gerecs, Corresponding Member of the academy, and Laszlo Mester, Doctor of Chemistry.

Zoltan Ozorai, Candidate of Physics, for his dissertation, "One Type of Characteristic Weather Situation Occurring in Our Country." His opponents were Laszlo Aujeszky, Candidate of Physics, and Zoltan Berkes, Candidate of Geography.

Kato Renyi, Candidate of Mathematics, for her dissertation, "A Conjecture of Gyorgy Polya." Her opponents were Pal Erdos and Laszlo Kalmar, Corresponding Members of the academy.

Imre Safarik, Candidate of Chemistry, for his dissertation, "Study of the Anode Polarization of the Pt-Electrode in H_2SO_4 Solution." His opponents were Pal Szarvas, Candidate of Chemistry, and Marta Deri, Candidate of Engineering.

Istvan Sajo, Candidate of Chemistry, for his dissertation,""The Formation of the Vanadium (V) Complex on and Its Utilization in Analysis." His opponents were Laszlo Zombori, Candidate of Chemistry, and Jozsef Mika, Doctor of Chemistry.

Imre Szebenyi, Candidate of Chemistry, for his dissertation, "Desulfurization of Petroleum Distillates Through Hydrogenation." His opponents were Gyula Nyul and Laszlo Vajta, Candidates of Chemistry.

Pal A. Szilas, Candidate of Engineering, for his dissertation, "Determination of Operating Characteristics of Gas-Free Oil Wells From Surface Statistics." His opponents were Richard Falk, Candidate of Engineering, and Zoltan Gyulay, Candidate of Geology and Mineralogy.

Vera T. Sos, Candidate of Mathematics, for her dissertation," A Geometric Interpolation of Continuous Fractions and Its Application in the Theory of Diophantine Approximations." Her opponents were Alfred Renyi, Academician, and Janos Suranyi, Doctor of Mathematics.

Gyula Vajda, Candidate of Medicine, for his dissertation, "Pathological Aspects of Cytotropine." His opponents were Endre Jeney and Jozsef Sos, Doctors of Medicine.

Andor Kertesz, Doctor of Mathematics, for his dissertation, "The General Theory of Operator Moduli." His opponents were Laszlo Redei, Academician, Laszlo Fuchs, Doctor of Mathematics, and Janos Szendrei, Candidate of Mathematics.

Ivan Rode, Doctor of Medicine, for his dissertation, "Clinical and Radiation Biological Properties of Mellanoglastoma." His opponents were Laszlo Haranghy, Corresponding Member of the Academy, and Nandor Ratkoczy and Lajos Szodorai.

Lajos Szeniczei, Doctor of Engineering, for his dissertation, "Strength Calculation of Bevel Gear Drives." His opponents were Jeno Egervary, Academician; Laszlo Gillemot, Corresponding Member of the academy; and Emil Videky, Doctor of Engineering.

Jeno Szep, Doctor of Mathematics, for his dissertation, "A New Enlargement of Rings." His opponents were Gyorgy Hajos and Laszlo Redei, Academicians, and Laszlo Fuchs, Doctor of Mathematics.

Peter Veghelyi, Doctor of Medicine, for his dissertation, "Hibernation in Pediatrics." His opponents were Odon Kerpel-Fronius, Corresponding Member of the academy, and Szilard Donhoffer and Jozsef Sos, Doctors of Medicine.

Karoly Bakondi, Candidate of Engineering, for his dissertation, "The Workability of Metals." His opponents were Andor Hornung, Doctor of Engineering, and Sandor Ulbrich, Candidate of Engineering.

Mihaly Beck, Candidate of Chemistry, for his dissertation, "Data on the Chemistry and Analytical Use of Complex Compounds." His opponents were Janos Proszt, Corresponding Member of the academy, and Laszlo Zombori, Candidate of Chemistry.

Ivan Bocsa, Candidate of Agronomy, for his dissertation, "Experiments in the Development of a Hungarian Monoecious Hemp." His opponents were Laszlo J. Berzsenyi and Ferenc Beke, Candidates of Agronomy.

Matyas Bognar, Candidate of Mathematics, for his dissertation, "Interpolation of Topological Space Into Euclidian Space." His opponents were Laszlo Fuchs, Doctor of Mathematics, and Gyula Soos, Candidate of Mathematics.

Miklos Boszormenyi, Candidate of Medicine, for his dissertation, "Relapses in Cases of Adult Alveolar Tuberculosis." His opponents were Ferenc Kovats and Karoly Farkas, Doctors of Medicine.

Gyula Csikai, Candidate of Physics, for his dissertation, "Investigation With Wilson Chamber of the Recoil Effect of the Neutrino and the Angle Correlation of the Electron-Neutrino in the beta Decay of He^6." His opponents were Zoltan Gyulai, Academician, and Gyorgy Marx, Doctor of Physics.

Karoly Gyonos, Candidate of Chemistry, for his dissertation, "Theoretical and Practical Investigation of Heat Penetration as a Factor in Preservation by Heat-Treatment." His opponents were Zoltan Sandor and Konstantin Vukov, Candidates of Chemistry.

Lajos Gyorgy, Candidate of Medicine, for his dissertation, "Comparative Pharmacological Investigation of Paralyzers of the Sympathetic Nervous System." His opponents were Kalman Lissak, Academician, and Gyula Mikes, Candidate of Medicine.

Ferenc Kajtor, Candidate of Medicine, for his dissertation, "Analysis of the Convulsion Potential Induced by Evipan Anaesthesia in Persons Having Parietal Lobe Epilepsy." His opponents were Bela Horanyi, Doctor of Medicine, and Ferenc Obal, Candidate of Medicine.

Arpad Kardos, Candidate of Engineering, for his dissertation, "Investigation of the Workability of Aluminum Alloy." His opponents were Laszlo Kazinczy and Sandor Ulbrich, Candidates of Engineering.

Kalman Kovacs, Candidate of Medicine, for his dissertation, "Role of the Hypothalmus-Hypophysis System in the Metabolism of Water." His opponents were Miklos Julesz and Mihaly Foldi, Doctors of Medicine.

Kazmer Nagy, Candidate of Physics, for his dissertation, "Investigation of the Physical Nucleon Through Configurational Spatial Techniques." His opponents were Janos Horvath and Karoly Nagy, Candidates of Physics.

Szaniszlo Priszter, Candidate of Biology, for his dissertation, "Ecological-Areogeographic Relations of Adventitious Plants of Hungary." His opponents were Rezso Soo, Academician, and Zoltan Karpati, Doctor of Biology.

Lajos Sin, Candidate of Medicine, for his dissertation, "The Transplanting and Fate of Preserved and Fixed Blood Vessels." His opponents were Istvan Kunos and Gyula Botar, Candidates of Medicine.

Jeno Schlattner, Candidate of Chemistry, for his dissertation, "The Influence of Ash on the Fuel Value of Hard Coal." His opponents were Elemer Szadeczky-Kardoss, Academician, and Bela Vecsey, Candidate of Engineering.

Arpad Szeghegyi, Candidate of Engineering, for his dissertation, "Electrotechnical and Technical Aspects of Ilgner Drives." His opponents were Pal K. Kovacs, Corresponding Member of the academy, and Ervin Kiss, Candidate of Engineering.

Gyula Szelecky, Candidate of Medicine, for his dissertation, "Post-operative Basedow Crisis." His opponents were Endre Hedri and Ferenc Gyeyda-Pommersheim, Candidates of Medicine.

Peter Szepfalusy, Candidate of Physics, for his dissertation, "Further Development of the Statistical Treatment of Fermi Gas." His opponents were Janos Horvath and Albert Konya, Candidates of Physics.

Maria Tenyi, Candidate of Medicine, for her dissertation, "The Origin of Coronary Sclerosis and Clinical and Experimental Investigations of the Metabolic Changes Which Accompany It." Her opponents were Gabor Czomiczer and Gyorgy Gabor, Candidates of Medicine.

Imre Tomka, Candidate of Medicine, for his dissertation, "Study of Conditioned Reflex Associations in Early Childhood Based on the Tone of Voice." The dissertation was defended in the USSR.

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